MINERAL PRODUCTION IN IOWA IN 1928 and 1929

by

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MINERAL PRODUCTION IN 1928*

OUTLINE

The mineral industry showed improvement in nearly all its branches during 1928. Quantities and values were greater in cement, coal and stone, and the value of sand and gravel sold was greater even though the quantity was somewhat less. The clay and gypsum working industries showed declines, slight in the case of clay wares but serious in the gypsum products business. These decreases are doubtless to be attributed to tightening of business conditions, resulting in less building, as similar falling off was observed in production of building sand and gravel.

In the United States as a whole mineral production showed little change from 1927. The total value of all products was $5,384,900,000 in 1928 as contrasted with a value of $5,529,500,000 in 1927, a decline of 2 per cent. This decrease was due almost entirely to a lowering in the value of mineral fuels produced. The quantity and value of coal and petroleum decreased, although more gas and natural gasoline were produced. It is interesting to note the relative values of metallic and nonmetallic materials produced in this country. For 1928 these were as follows:

Metallic	**$1,284,580,000**
Nonmetallic except fuels	1,206,158,000
Mineral fuels	2,884,962,000
Others	9,200,000
	$5,384,900,000

* Statistics for clay wares are collected by the Bureau of the Census. Other statistics are collected and compiled by the Bureau of Mines in co-operation with the Iowa Geological Survey.

Mineral Production in Iowa in 1927 and 1928

Product	Unit	1927		1928	
		quantity	*value*	*quantity*	*value*
Cement	bbl. 376 lb.	5,661,234	$ 9,124,405	6,880,731	$ 10,734,838
Clay wares			5,194,780		5,048,774
Coal	ton	2,949,622	9,304,000	3,683,635	10,525,000
Gypsum	ton	723,942	6,713,497	719,736	5,355,214
Limestone and lime	ton	1,278,056	1,267,033	1,666,270	1,742,252
Sand and gravel	ton	3,981,143	1,839,176	3,423,619	2,094,955
			33,442,891		35,501,033

CEMENT

The production of Portland cement in Iowa was 31 per cent greater in 1928 than in 1927 and shipments were 22 per cent greater. This increase may be attributed in part, no doubt, to the state's extensive road-making program, which involves the building of a great number of cement culverts and bridges as well as the paving of many miles of roadway. Improved business conditions permitted resumption of operation at the Gilmore City plant of the Northwestern States Portland Cement Company, which had been idle for two years. With the reopening of this plant all six factories of the state were in operation. Three of the plants, the newer ones, use the wet process of manufacture, while the others use the dry process. Even with improved conditions production and shipments were far below the real capacity of the plants, as is shown by the figures given below.

The manufacturing district that includes Iowa, eastern Missouri, Minnesota and South Dakota increased production by 16 per cent and shipments by 14 per cent in 1928 over 1927, although the average price per barrel declined from $1.60 to $1.56. Figures for production in Iowa follow.

Production of Cement in Iowa

	1926	1927	1928
Production, bbls.	4,925,811	5,415,144	7,070,172
Stock, Dec. 31, bbls.	1,616,842	1,370,481	1,559,925
Shipments, bbls.	4,788,639	5,661,234	6,880,731
Shipments, value	$8,167,341	$9,124,405	$10,734,838
Average factory price per bbl.	$1.71	$1.61	$1.56
Consumption, bbls., Est.	2,826,839	3,708,471	5,348,807
Consumption per capita, bbls., Est.	1.17	1.53	2.20
Surplus production, bbls.	1,961,800	1,952,763	1,531,924
Annual capacity, bbls.	6,575,000	7,935,000	9,593,000

Shipments of cement from mills into Iowa by months in 1928 were as follows:

Jan.	30,488	Apr.	405,654	July	873,528	Oct.	442,740
Feb.	41,520	May	929,356	Aug.	813,328	Nov.	96,294
Mar.	149,705	June	790,414	Sept.	738,450	Dec.	34,397

Some statistics for the United States in 1928 are given herewith:

States	Plants	Production	Shipments		Aver. fact. price per bbl.
		bbls.	*bbls.*	*value*	
Alabama	6	6,749,202	6,696,684	$ 8,233,872	$ 1.23
California	12	13,555,579	13,699,851	25,906,942	1.89
Illinois	4	7,334,833	7,405,667	11,602,848	1.57
Iowa	6	7,070,172	6,880,731	10,734,838	1.56
Kansas	7	6,574,219	6,787,568	10,091,330	1.49
Michigan	14	13,848,561	14,044,230	19,268,707	1.37
Missouri	5	7,881,118	7,943,367	12,367,018	1.56
Ohio	10	9,233,033	9,364,338	14,928,183	1.59
Pennsylvania	26	41,522,401	41,161,019	62,572,588	1.52
Tennessee	6	4,689,703	4,634,280	6,322,213	1.36
Texas	7	6,345,604	6,231,083	10,938,646	1.76
Other States	53	51,494,421	50,989,514	83,005,760	1.63
Totals	156	176,298,846	175,838,332	275,972,945	1.57
1927	153	173,206,513	171,864,728	278,854,647	1.62

Consumption of fuel for cement making in the United States in 1928 was: Anthracite coal, 210,390 tons; bituminous coal, 9,592,041 tons; oil, 3,508,038 barrels of 42 gallons; natural gas, 30,660,348,200 cubic feet. The use of fuel per barrel of cement (376 pounds) produced was: Coal, 131.1 pounds; oil, 0.2495 barrel; natural gas, 2,133.7 cubic feet. Dry process plants burning coal used 122 pounds per barrel of cement, while wet process plants used 148 pounds per barrel. Dry process plants burning oil used 10 gallons per barrel of finished cement and wet process plants used 11.2 gallons per barrel of cement.

CLAY WARES

The output of brick of various kinds was somewhat greater in 1928 than in 1927, but as prices were lower the value was less. Just the opposite conditions prevailed in the case of hollow ware, as the output was less but the value greater. However, the total value of the output was somewhat less than in 1927 and fewer plants were active. It seems that the manufacture of clay products is being concentrated more and more in the larger plants of the state, presumably those that have easily accessible and large deposits of high grade clay and that are

close to large markets. In 1928 forty-eight plants located in 30 counties were operated as compared with 55 plants in 33 counties in 1927. Because of the small number of plants it is necessary to combine the statistics of most of the counties, as very few counties have three or more producers. It should be noted, perhaps, that in the table showing output by counties the total at the foot of each column is not the sum of the items given in the column, as it was necessary in several cases to transfer items from one column to another. The totals given are those actually applying to the classes of ware named in the different columns.

The first table here given shows the production in 1927 and 1928 grouped by classes of materials. The second shows output by counties in 1928.

Production of Clay Wares by Classes

Class	1927			1928		
	No.	*quan. thous.*	*value*	*No.*	*quan. thous.*	*value*
Common brick	36	51,885	$ 564,425	40	57,224	$ 640,684
Face brick	20	23,720	397,945	23	19,449	359,366
Hollow and vitrified brick	8	14,448	257,325	4	14,343	140,803
Hollow building tile		*tons*			*tons*	
(a) Partition, load-bearing, furring, book tile	30	232,575	1,363,354	35	235,148	1,623,247
(b) Floor-arch, silo, and corn crib tile; conduits; radial chimney blocks; fire-proofing	10	60,486	403,299	9	52,798	398,969
Drain tile	41	176,404	1,167,542	37	130,235	1,018,074
Sewer pipe	4	65,322	913,676	4	52,639	715,233
Flue lining	4	3,925	46,778	4	4,599	49,101
Wall coping	4	972	17,924	4	868	13,252
Floor tile, segment blocks, flower pots, other ware	7		45,996	7		68,025
Clay sold	3	2,828	15,216	4	2,339	22,020
	55		5,194,780	48		5,048,774

The Bellevue pottery continues the manufacture of red earthenware flower pots and similar ware. The clay sold raw is mostly classed as fire clay, although a little is of finer grade and is said to be used in soaps. Clay sales in the United States in 1928 amounted to $12,200,739, to which fire clay contributed $7,480,609, kaolin, $4,088,003, and other kinds lesser amounts.

Production of Clay Wares in Iowa in 1928

Counties	No. Producers	Brick (a)		Hollow ware (b)		Drain tile, sewer pipe, other products (c)		Total Value
		thous.	*value*	*tons*	*value*	*tons*	*value*	
Allamakee (1), Dubuque (1), Fayette (1), Floyd (1)	4	2,919	$ 36,826	20,632	$ 147,168	(d)		$ 183,994
Appanoose (1), Henry (1), Jefferson (1), Johnson (1)	4	677	8,972	2,157	17,151			26,123
Audubon (2) Woodbury (2)	4	22,531	254,468	4,794	32,523			286,991
Benton (1), Grundy (1), Hardin (1), Tama (2), Wright (1)	6	2,276	33,590	(e)		1,714	$ 15,900	49,490
Cerro Gordo (2), Franklin (1)	3	6,656	88,135	152,121	1,103,492	46,526	370,805	1,562,442
Dallas	4	4,747	72,110	44,002	299,143	23,490	198,032	569,285
Jackson (1), Scott (1), Washington (1)	3	(d)		2,000	34,378	(d)		34,378
Jasper (1), Mahaska (2), Poweshiek (1)	4	7,800	76,959	(f)		807	6,053	83,012
Keokuk	3	(e)		(e)		17,860	195,969	195,969
Polk	4	19,073	297,310	19,505	589,023	15,180	163,290	589,023
Story (1), Wapello (1), Warren (1)	3	3,629	43,787	18,574	127,388	8,792	64,478	235,653
Webster	6	20,597	236,449	35,563	247,683	65,496	758,292	1,232,424
Total for 1928	48	91,016	1,140,853	287,946	2,022,216	182,874	1,885,705	5,048,774
Total for 1927	55	90,053	1,219,695	293,061	1,766,653	251,000	2,208,432	5,194,780

(a) Includes: Common brick, face brick, hollow brick, paving and other vitrified brick.
(b) Includes: Partition, load-bearing, floor arch, silo and corn crib tile, fire-proofing, etc.
(c) Includes: Floor tile, flue lining, wall coping, segment blocks, other products, pottery, raw clay.
(d) Included in Hollow Ware.
(e) Included with Drain Tile.
(f) Included with Brick.

The leading states of the Union in the making of clay wares in 1928 were these:

State	Brick and tile	Pottery	Total
California	$ 16,721,960	$ 4,271,387	$ 20,993,347
Illinois	26,328,670	5,698,215	32,026,885
Indiana	12,932,816	3,613,895	16,546,711
Iowa	5,048,774		5,048,774
Kentucky	6,954,582	158,941	7,113,523
Michigan	3,019,297	3,291,289	6,310,586
Missouri	14,891,273		14,891,273
New Jersey	18,160,009	21,219,269	39,379,278
New York	15,422,513	7,051,892	22,474,405
Ohio	47,867,039	33,981,383	81,848,422
Pennsylvania	40,861,414	7,067,389	47,928,803
Texas	5,992,538	184,264	6,176,802
West Virginia	5,019,880	14,007,665	19,027,545
Total for United States	$265,770,513	$107,780,369	$373,550,882

COAL

The coal industry began its laborious climb out of the slough of despond in which the strike of 1927 had left it, and production increased materially over that of the preceding year. While the output was not equal to that before the strike its increase shows that the industry is once more on a good footing. Brightening prospects have increased the number of mines, particularly the smaller ones, whose owners are not able to continue operations when conditions become adverse. It is unfortunate for Iowa, however, that as a result of the strike the Superior Coal Company closed its mines in this state and has withdrawn from the Monroe county field. As this was for many years the leading producer in the county, and indeed in the state, its removal affects Monroe county's production seriously. For several years Marion county has held the lead which Monroe had for so long, because of the opening of the rich Marion county fields by the Consolidated Indiana, Pershing and Red Rock Coal Companies at the same time that the large operators of Monroe county were approaching the end of their activities. In 1918 Monroe's coal output was 2,317,900 tons, as compared with 351,764 tons in 1928. Marion county's output in the same years was 609,266 tons and 848,294 tons respectively.

Large gains were made in 1928 over the preceding year by Appanoose, Lucas, Marion and Warren counties. While only Marion and Polk are now in the one-half-million tons class, as compared with three counties which produced over a million tons each in 1918, yet

*Production, Value, Men Employed, Days Worked, and Output per Man per Day at Coal Mines in Iowa in 1928.**
(Exclusive of product of wagon mines producing less than 1,000 tons)

County	No. Producers	Net tons				Value		Number of employees			Average number of days worked	Average tons per man per day
		Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for steam and heat	Total quantity	Total	Average per ton	Underground	Surface	Total		
Adams (4) and Page (2)	6	.....	31,952	.....	31,952	$ 96,000	$ 3.00	54	5	59	233	2.32
Appanoose	59	394,772	69,629	885	465,286	1,310,000	2.82	1,313	109	1,422	159	2.06
Boone	5	323,633	70,860	3,383	397,876	1,460,000	3.67	868	47	915	171	2.54
Dallas	6	272,394	8,469	1,178	282,041	810,000	2.87	593	47	640	139	3.16
Davis (1), Jefferson (2), and Keokuk (1)	4	.....	4,760	10	4,770	17,000	3.56	21	3	24	102	1.94
Greene (2) and Webster (2)	4	.....	9,239	240	9,479	33,000	3.48	24	4	28	168	2.01
Guthrie	7	.....	9,131	.....	9,131	36,000	3.94	36	4	40	124	1.84
Jasper	8	3,741	41,066	2,815	47,622	137,000	2.88	84	13	97	149	3.30
Lucas	4	300,710	28,087	8,838	337,635	1,020,000	3.02	391	34	425	161	4.93
Mahaska	28	.....	52,241	86	52,327	138,000	2.64	137	10	147	152	2.34
Marion	19	776,173	54,695	17,426	848,294	2,017,000	2.38	919	56	975	213	4.08
Monroe	12	321,889	25,498	4,377	351,764	942,000	2.68	649	52	701	174	2.89
Polk	15	298,107	269,633	7,614	575,354	1,688,000	2.93	860	69	929	206	3.00
Taylor	3	4,206	11,118	.....	15,324	63,000	4.11	51	3	54	175	1.62
Van Buren	6	4,285	5,954	100	10,339	31,000	3.00	30	1	31	154	2.17
Wapello	21	3,281	58,163	.....	61,444	182,000	2.96	139	13	152	154	2.63
Warren	5	146,157	10,691	5,945	162,793	481,000	2.95	239	25	264	176	3.50
Wayne	4	.....	20,204	.....	20,204	64,000	3.17	57	5	62	161	2.02
Total for 1928	215	2,849,348	781,390	52,897	3,683,635	10,525,000	2.86	6,465	500	6,965	175	3.02
Totals for 1927	176	2,146,788	746,755	56,079	2,949,622	9,304,000	3.15	8,085	656	8,741	114	2.96

* The figures relate only to active mines of commercial size that produced coal in 1928. The number of such mines in Iowa was 222 in 1928; 183 in 1927; and 193 in 1926.

Methods of mining in 1928: The tonnage by hand was 379,742, 10.3 per cent; shot off the solid, 2,030,875, 55.1 per cent; cut by machines, 1,199,538, 32.6 per cent; not specified, 73,480, 2 per cent.

Size classes of commercial mines in 1928: There were 4 mines in Class 1 B (200,000 to 500,000 tons) producing 1,182,582 tons or 32.1 per cent of the tonnage; 5 in Class 2 (100,000 to 200,000 tons) with 784,590 tons or 21.3 per cent; 6 in Class 3 (50,000 to 100,000 tons) with 417,609 tons or 11.3 per cent; 34 in Class 4 (10,000 to 50,000 tons) with 878,795 tons or 23.9 per cent; 173 in Class 5 (less than 10,000 tons) producing 420,059 tons or 11.4 per cent.

the record of these counties indicates a gradual increase in output and use of Iowa coal.

The output per day, 3.02 tons, was the highest of any recent year except 1925, when it was the same as this year. The output per man per year, 525 tons, also was the highest except for 1920, when it was 653 tons. The average tonnage per underground man in 1928 was 3.26 per day or 570 per year.

Iowa has been somewhat laggard in the use of machinery in mining coal. In 1913 there were 28 coal cutting machines and in 1927 this number had risen to 93, but in 1928 only 84 were in use. The percentage of coal cut by machines in 1928, which was 32.6, does not compare very favorably with that so mined in other leading coal producing states, such for instance as 64 in Alabama, 56 in Colorado, 75 in Illinois, 90 in Kentucky, 68 in Pennsylvania, 85 in Virginia and West Virginia.

It may be of interest to note, although it is not flattering to state pride, that Iowa ranked next to the bottom in the percentage of coal produced the value of which was actually reported to the Bureau of Mines in 1928. The percentage was 74.05 and the lowest state was Oklahoma with a percentage of 58.72.

ANALYSES OF IOWA COAL

In 1928 the Iowa Geological Survey collected 36 one-gallon samples of coal from mines widely distributed over the coal-producing districts of this state. These samples were gathered by the most approved methods and were sent to the chemical laboratory of the State University of Iowa. There they were subjected to analysis and to various tests. Some of the results of this work were published by the Survey in technical bulletins and the more important data are reproduced here in order to put them in more permanent form.

Table I, Names and Location of Mines Sampled

No.

1.—Des Moines Ice & Fuel Co., Des Moines, Polk Co.
2.—Bennett Bros. Coal Co., Mine No. 2, Des Moines, Polk Co.
3.—Economy Coal Co., Des Moines, Polk Co.
4.—Des Moines Coal Co., Mine No. 4, Des Moines, Polk Co.
5.—Urbandale Coal Co., Des Moines, Polk Co.
6.—Beck Coal & Mining Co., Des Moines, Polk Co.
7.—Shuler Coal Co., Waukee, Dallas Co.
8.—Gibson Coal Co., Rider, Polk Co.
9.—Great Western Coal Co., Orillia, Warren Co.
10.—Indian Valley Gloss Coal Co., Hartford, Warren Co.
11.—Norwood White Coal Co., No. 8, Herrold, Polk Co.
12.—Norwood White Coal Co., No. 7, Moran, Dallas Co.

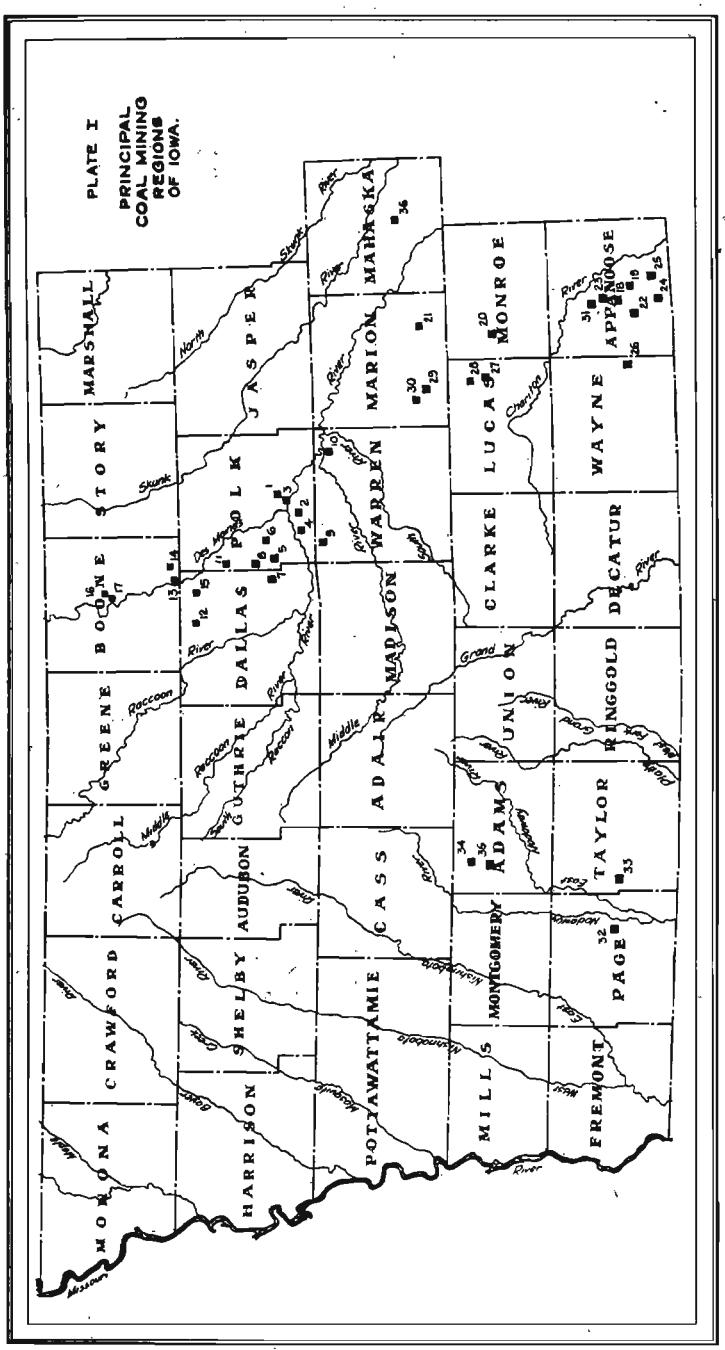


PLATE I
PRINCIPAL COAL MINING REGIONS OF IOWA.
MARSHALL
STORY
BOONE
GREENE
CARROLL
CRAWFORD
MONONA
JASPER
POLK
DALLAS
GUTHRIE
AUDUBON
SHELBY
HARRISON
MARION
WARREN
MADISON
ADAIR
CASS
POTTAWATTAMIE
MONROE
LUCAS
CLARKE
UNION
ADAMS
MONTGOMERY
MILLS
WAYNE
APPANOOSE
DECATUR
RINGGOLD
TAYLOR
PAGE
FREMONT
Missouri
Skunk
North Skunk
Des Moines
Boone
Raccoon
North Raccoon
Middle
South Raccoon
Grand
Middle Nodaway
East Nodaway
West Nodaway
Nishnabotna
East Nishnabotna
West Nishnabotna
Keg
Thompson
Platte
Little Platte
Weldon
Chariton
Honey
Whitebreast
Locust
Indian
Mosquito
Turkey
Soap
Clear
Long
Silver
Walnut
Troublesome
Prairie
Hardin
Indian
Big
Elk
Rock
Bear
Cedar
Crooked
Pigeon
Mill
Sharp
Hundred and Two
Nodaway
Tarkio
Weeping Water
Little Nemaha
Big Nemaha
Missouri River

13.—Scandia Coal Co., No. 4, Madrid, Boone Co.
14.—Scandia Coal Co., No. 6, Madrid, Boone Co.
15.—Dallas Products Co., Granger, Dallas Co.
16.—Benson Coal Co., No. 1, Boone, Boone Co.
17.—Boone Coal Co., No. 1, Boone, Boone Co.
18.—Old King Coal Co., Centerville, Appanoose Co.
19.—Center Coal Co., Centerville, Appanoose Co.
20.—Superior Coal Co., No. 19, Bucknell, Monroe Co.
21.—Pershing Coal Co., No. 12, Pershing, Marion Co.
22.—Numa Coal Co., Appanoose Co.
23.—Appanoose Co. Coal Co., Centerville, Appanoose Co.
24.—Armstrong Coal Co., Cincinnati, Appanoose Co.
25.—Iowa Block Coal Co., Exline, Appanoose Co.
26.—Violet Valley Coal Co., Seymour, Wayne Co.
27.—Central Iowa Fuel Co., No. 5, Williamson, Lucas Co.
28.—Central Iowa Fuel Co., No. 4, Williamson, Lucas Co.
29.—Red Rock Coal Co., Melcher, Marion Co.
30.—Consolidated Indiana Coal Co., No. 2, Melcher, Marion Co.
31.—Liberty Coal Co., No. 3, Mystic, Appanoose Co.
32.—Pearson Coal Co., No. 2, Clarinda, Page Co.
33.—New Market Coal Co., New Market, Taylor Co.
34.—John G. Henton Mine, R. F. D. No. 1, Carbon, Adams Co.
35.—Ruth Coal Co., Carbon, Adams Co.
36.—Oskaloosa Coal & Mining Co., Oskaloosa, Mahaska Co.

In presenting Table II, which gives analytical data on the so-called "as received" basis, we wish first to call attention to the moisture content column. As explained above, in collecting the sample the water in the coal is carefully conserved so that it may be measured in the laboratory, but it should be clearly understood that in no wise does this figure represent the moisture percentage of the coal delivered to the consumer after having been in contact with drying air for days or weeks while in transit or storage. The actual moisture value of a coal at a given time is of course dependent upon the humidity of the air and upon the time of exposure to it. It is difficult therefore to estimate how much moisture these coals would contain under marketing conditions, but it is safe to say that the percentages are vastly lower than those given for mine conditions. With lower total moisture values the percentage contents of the other constituents, and also the thermal values, increase in proportion.

Table II, Results of Analyses of Iowa Coals

	As Received					
No.	Moisture	Ash	Volatile	Fixed carbon	Thermal values (B. t. u.)	Sulfur
1.	16.0	8.7	37.3	37.9	10,820	5.3
2.	16.8	14.5	35.0	33.7	9,190	5.8
3.	15.9	9.2	37.1	37.7	10,530	5.0
4.	13.8	16.9	34.3	34.9	9,040	5.6
5.	14.2	13.0	36.3	36.5	10,220	5.2
6.	16.7	15.5	33.0	34.7	9,660	3.8
7.	14.2	12.7	34.7	38.3	10,450	3.9
8.	13.7	6.5	39.5	40.3	11,450	3.7

Table II (Continued)

No.	Moisture	Ash	Volatile	Fixed carbon	Thermal values (B. t. u.)	Sulfur
9.	13.1	14.6	35.4	36.8	10,210	6.3
10.	14.6	10.6	39.1	35.7	10,830	4.8
11.	13.6	14.6	36.8	35.0	10,050	5.2
12.	16.9	12.3	33.9	36.9	9,920	3.1
13.	14.9	10.3	36.9	37.8	10,450	3.5
14.	15.1	12.5	36.9	35.5	10,050	4.1
15.	16.2	14.0	34.5	35.3	9,690	3.8
16.	20.9	8.5	33.8	36.7	9,430	4.0
17.	19.7	9.3	36.3	34.7	9,740	4.8
18.	18.1	8.6	33.9	39.4	10,050	3.7
19.	18.0	6.5	35.7	39.7	10,430	2.7
20.	14.8	9.8	35.0	40.4	10,700	2.1
21.	17.1	9.4	34.9	38.6	10,490	3.5
22.	17.6	11.0	36.7	34.7	9,880	4.5
23.	15.3	12.2	34.6	37.9	9,960	3.9
24.	13.4	10.3	35.6	40.7	10,490	4.9
25.	14.9	9.7	36.3	39.1	10,750	3.4
26.	16.7	8.3	34.1	40.8	10,350	3.9
27.	15.8	14.0	33.6	36.5	9,950	5.3
28.	19.8	12.8	32.7	34.6	9,460	2.0
29.	18.5	10.4	32.6	38.5	10,000	2.6
30.	18.6	9.2	31.9	40.2	10,030	2.6
31.	15.6	11.0	35.2	38.2	9,800	3.3
32.	18.4	13.7	35.3	32.6	9,440	3.4
33.	20.2	13.3	33.6	32.9	9,080	5.5
34.	21.1	9.9	32.9	36.1	9,280	3.5
35.	20.6	12.3	33.0	34.1	9,270	3.1
36.	18.1	10.0	33.5	38.4	10,610	2.0
Mean	16.6	11.4	35.0	37.0	10,040	3.9

Table IV, in which the results of the preceding table are calculated to the dry basis, needs no comment except perhaps in explanation of the term "unit coal." This in brief is a hypothetical material intended to represent the pure or actual coal substance calculated from analytical data after taking into consideration corrections for moisture and ash. As developed by Parr the formula is

$$\text{Unit coal} = 1.00 - \left(W + 1.08\ A + \frac{22}{40} S\right)$$

where W, A and S are total water, ash as weighed and sulfur respectively.

This "unit coal" value which represents the decomposition residue of a flora characteristic of a given period and region should, if the history of the seam formation is normal, be fairly constant for that given seam. This has proved to be the case particularly where the coal measures are of comparatively large area, as in Illinois. A tabulation of unit coal values of the three beds represented in this study (see tabulation by Lees in table No. VII) shows rather wide variation and it is evident that calculated heating values of a sample from the given bed, based on

average unit coal value for that bed, would not be highly accurate. The mean values of the figures in question are given in the following table:

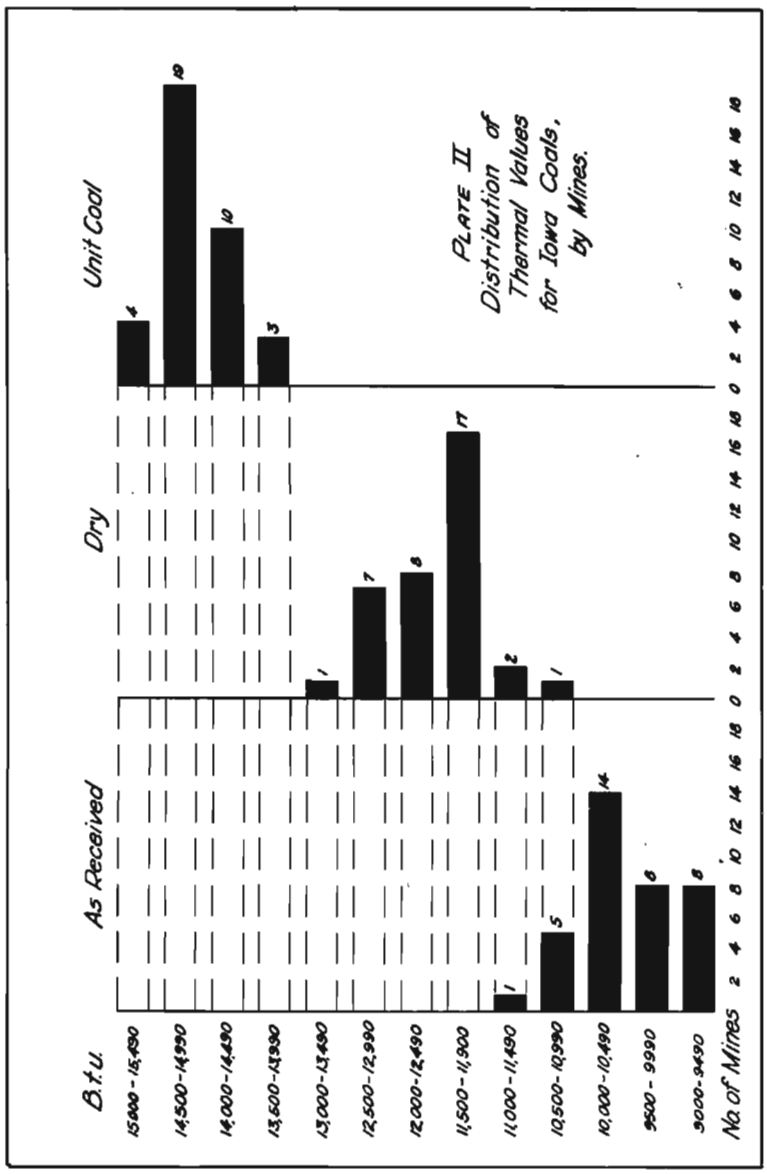
Table III, Average Unit Coal Values of Iowa Coal Beds

Lower Cherokee bed	14,671 B. t. u.
Mystic bed	14,345 B. t. u.
Nodaway bed	14,365 B. t. u.

Table IV, Results of Analyses of Iowa Coals

	Dry Basis					
No.	Ash	Volatile	Fixed carbon	Thermal values (B. t. u.)	Sulfur	Unit coal
1.	10.4	44.5	45.4	12,900	6.3	15,110
2.	17.4	42.1	40.5	11,050	7.0	14,290
3.	11.0	44.2	44.9	12,550	5.9	14,730
4.	19.6	39.8	40.6	10,500	6.5	13,950
5.	15.2	42.3	42.5	11,910	6.1	14,760
6.	18.6	39.7	41.7	11,600	4.6	14,970
7.	14.8	40.5	44.7	12,200	4.6	14,950
8.	7.5	45.8	46.7	13,260	4.3	14,830
9.	16.8	40.8	42.4	11,750	7.3	15,100
10.	12.4	45.8	41.8	12,620	5.6	15,110
11.	16.9	42.6	40.5	11,630	6.0	14,850
12.	14.8	40.8	44.4	11,940	3.7	14,560
13.	12.1	43.4	44.5	12,300	4.1	14,550
14.	14.7	43.5	41.8	11,840	4.8	14,530
15.	16.7	41.2	42.1	11,560	4.6	14,550
16.	10.8	42.8	46.4	11,950	5.1	13,990
17.	11.6	45.2	43.2	12,130	6.0	14,430
18.	10.5	41.4	48.1	12,270	4.5	14,270
19.	7.9	43.6	48.5	12,730	3.3	14,210
20.	11.5	41.1	47.4	12,550	2.5	14,550
21.	11.3	42.1	46.6	12,650	4.2	14,800
22.	13.3	44.6	42.1	11,990	5.5	14,520
23.	14.4	40.9	44.7	11,750	4.7	14,360
24.	11.9	41.2	46.9	12,120	5.6	14,430
25.	11.5	42.6	45.9	12,630	4.0	14,790
26.	9.9	40.7	49.4	12,420	4.7	14,330
27.	16.6	39.9	43.5	11,810	6.3	15,020
28.	15.9	40.6	43.5	11,810	2.5	14,510
29.	12.8	39.9	47.3	12,260	3.1	14,510
30.	11.3	39.1	49.6	12,330	3.2	14,330
31.	13.0	41.7	45.3	11,620	4.0	13,870
32.	16.7	43.2	40.1	11,560	4.2	14,500
33.	16.7	42.0	41.3	11,380	7.0	14,570
34.	12.5	41.6	45.9	11,760	4.5	14,000
35.	15.5	41.6	42.9	11,680	3.9	14,390
36.	12.2	40.9	46.9	12,960	2.4	15,140
Mean	13.6	42.0	44.4	12,045	4.8	14,555

Plate II gives a graphical analysis of all the preceding data wherein thermal values are plotted as ordinates against the number of mines from which samples having these thermal values were obtained.



It is interesting to compare the results of this and of Hixson's survey (in Vol. XIX) with those of a similar one from an adjoining state. From a list compiled by Parr from Bull. No. 29, Illinois State Geological Survey, which gives figures on 36 samples of coal from 29 different counties, we have calculated the Illinois data given in the table below.

Table V, Comparative Data on Iowa and Illinois Coals

	MEAN VALUES (DRY BASIS)			
	Volatile matter	Ash	Sulfur	Thermal value
Iowa (36 samples)	42.0	13.6	4.8	12,045 B.t.u.
Iowa (16 samples)	40.1	13.7	4.9	12,552 B.t.u. (Hixson)
Illinois (36 samples)	37.3	11.0	3.7	12,725 B.t.u.

Total moisture contents on the wet basis were for the Iowa and Illinois coals 13.6, 15.1 and 12.4 respectively. It may be seen, therefore, that so far as proximate analyses can be relied upon to distinguish them, the difference is much less than is often popularly supposed.

FUSION TEMPERATURES OF IOWA COAL ASH

Because of the important bearing ash fusion temperatures have on the formation of slag and clinker in the coal furnace a systematic study was made of this phase of the problem.

The samples tested were from the coals described above. Quantities of the coal, 50 to 100 grams in weight, were ground to 60 mesh and burned in a gas fired muffle furnace. The ash was ground in an agate mortar and again heated to 1600 degrees F. in a stream of oxygen to insure the highest oxidation of all the mineral constituents. The finished material was then fashioned into small cones and heated in a special gas fired furnace under reducing conditions up to the softening points of the ash.

Temperatures were measured by means of an optical pyrometer of modern design.

Table VI, Melting Points of Iowa Coal Ash Degrees Fahrenheit

Numbers refer to samples as listed in Table I. Tests were made with a standard gas furnace under reducing conditions and temperatures were measured with an F. and F. optical pyrometer.

Number	Temperature	Number	Temperature
1	2063	19	2023
2	1981	20	2168
3	1940	21	1937
4	2035	22	1930
5	1935	23	2000
6	2063	24	1930
7	1947	25	1998
8	2033	26	1945
9	2025	27	1946
10	2193	28	2055
11	2177	29	2000
12	2192	30	1957
13	1960	31	2148
14	2353	32	2253
15	2005	33	2237
16	2037	34	2238
17	1889	35	1985
18	1980	36	2040

A final word may be said concerning the comparison of the values obtained in this work with those based on the analysis of the same, or similar coals made at other laboratories.

As we have already explained, all sampling for these studies was made by a member of the Geological Survey acting of course as an unbiased referee. The method used is both the most fair and the most severe, inasmuch as it provides for the inclusion of impurities in their proper proportions and precludes the possibility of either premeditated or unconscious "handpicking", which is a major factor in vitiating results. It follows, therefore, that comparisons between our figures and others can be made fairly, only when all are reduced to a common standard of sampling, analysis and calculation.

GEOGRAPHIC DISTRIBUTION OF SAMPLES

In the following table the mines which were sampled are arranged geographically from north to south so that the analyses of coals from different districts and from different beds can be more readily compared. The mines in the Mystic (or Centerville) bed are arranged from east to west; those in the Nodaway bed from north to south. Compare also Plate I. The first line following each mine number is the analysis "as received"; the next line represents the analysis "bone dry".

Table VII, Composition of Iowa Coals Tabulated by Beds

Lower Cherokee Beds

No.	Moisture	Ash	Volatile	Fixed carbon	B. t. u.	Sulfur	Unit coal
16.	20.98	8.5	33.8	36.7	9,430	4.0	
		10.8	42.8	46.4	11,950	5.1	13,990
17.	19.72	9.3	36.3	34.7	9,740	4.8	
		11.6	45.2	43.2	12,130	6.0	14,430
13.	14.97	10.3	36.9	37.8	10,450	3.5	
		12.1	43.4	44.5	12,300	4.1	14,550
14.	15.11	12.5	36.9	35.5	10,050	4.1	
		14.7	43.5	41.8	11,840	4.8	14,530
12.	16.94	12.3	33.9	36.9	9,920	3.1	
		14.8	40.8	44.4	11,940	3.7	14,560
15.	16.24	14.0	34.5	35.3	9,690	3.8	
		16.7	41.2	42.1	11,560	4.6	14,550
11.	13.64	14.6	36.8	35.0	10,050	5.2	
		16.9	42.6	40.5	11,630	6.0	14,850
7.	14.25	12.7	34.7	38.3	10,450	3.9	
		14.8	40.5	44.7	12,200	4.6	14,950
8.	13.74	6.5	39.5	40.3	11,450	3.7	
		7.5	45.8	46.7	13,260	4.3	14,830
5.	14.24	13.0	36.3	36.5	10,220	5.2	
		15.2	42.3	42.5	11,910	6.1	14,760
6.	16.78	15.5	33.0	34.7	9,660	3.8	
		18.6	39.7	41.7	11,600	4.6	14,970

Table VII (Continued)

No.	Moisture	Ash	Volatile	Fixed carbon	B. t. u.	Sulfur	Unit coal
9.	13.17	14.6	35.4	36.8	10,210	6.3	
		16.8	40.8	42.4	11,750	7.3	15,100
4.	13.89	16.9	34.3	34.9	9,040	5.6	
		19.6	39.8	40.6	10,500	6.5	13,950
2.	16.82	14.5	35.0	33.7	9,190	5.8	
		17.4	42.1	40.5	11,050	7.0	14,290
3.	15.99	9.2	37.1	37.7	10,530	5.0	
		11.0	44.2	44.9	12,550	5.9	14,730
1.	16.05	8.7	37.3	37.9	10,820	5.3	
		10.4	44.5	45.4	12,900	6.3	15,110
10.	14.6	10.6	39.1	35.7	10,830	4.8	
		12.4	45.8	41.8	12,620	5.6	15,110
30.	18.65	9.2	31.9	40.2	10,030	2.6	
		11.3	39.1	49.6	12,330	3.2	14,330
29.	18.52	10.4	32.6	38.5	10,000	2.6	
		12.8	39.9	47.3	12,260	3.1	14,510
28.	19.89	12.8	32.7	34.6	9,460	2.0	
		15.9	40.6	43.5	11,810	2.5	14,510
27.	15.88	14.0	33.6	36.5	9,950	5.3	
		16.6	39.9	43.5	11,810	6.3	15,020
21.	17.12	9.4	34.9	38.6	10,490	3.5	
		11.3	42.1	46.6	12,650	4.2	14,800
20.	14.80	9.8	35.0	40.4	10,700	2.1	
		11.5	41.1	47.4	12,550	2.5	14,550
36.	18.1	10.0	33.5	38.4	10,610	2.0	
		12.2	40.9	46.9	12,960	2.4	15,140
			Mystic Bed				
19.	18.09	6.5	35.7	39.7	10,430	2.7	
		7.9	43.6	48.5	12,730	3.3	14,210
25.	14.94	9.7	36.3	39.1	10,750	3.4	
		11.5	42.6	45.9	12,630	4.0	14,790
24.	13.42	10.3	35.6	40.7	10,490	4.9	
		11.9	41.2	46.9	12,120	5.6	14,430
22.	17.62	11.0	36.7	34.7	9,880	4.5	
		13.3	44.6	42.1	11,990	5.5	14,520
18.	18.14	8.6	33.9	39.4	10,050	3.7	
		10.5	41.4	48.1	12,270	4.5	14,270
23.	15.32	12.2	34.6	37.9	9,960	3.9	
		14.4	40.9	44.7	11,750	4.7	14,360
31.	15.61	11.0	35.2	38.2	9,800	3.3	
		13.0	41.7	45.3	11,620	4.0	13,870
26.	16.76	8.3	34.1	40.8	10,350	3.9	
		9.9	40.7	49.4	12,420	4.7	14,330
			Nodaway Bed				
34.	21.1	9.9	32.9	36.1	9,280	3.5	
		12.5	41.6	45.9	11,760	4.5	14,000
35.	20.6	12.3	33.0	34.1	9,270	3.1	
		15.5	41.6	42.9	11,680	3.9	14,390
33.	20.2	13.3	33.6	32.9	9,080	5.5	
		16.7	42.0	41.3	11,380	7.0	14,570
32.	18.4	13.7	35.3	32.6	9,440	3.4	
		16.7	43.2	40.1	11,560	4.2	14,500

In the United States as a whole coal production was on a lower level than in 1927. It amounted to 500,744,970 tons of bituminous coal, a decrease of 3.3 per cent from the year before. The number of active commercial mines and the number of men employed also decreased notably. In 1928 the operating mines totaled 6,450, a loss of 561 from the previous year, and the labor force was reduced 71,768, the total in 1928 being 522,150 men. The number of days worked per man in 1928 was 203, an improvement of 12 over 1927, and the daily output per man was 4.73 tons, a gain over 1927 of 0.18 ton and an increase of 1.12 tons since 1913.

The following tables give some salient statistics regarding bituminous coal production in the leading states:

State	Rank	Tons	Value	Av. Val.	Men	Tons per man daily
West Virginia	1	132,952,159	$ 211,480,000	$1.59	111,733	5.35
Pennsylvania	2	131,202,163	249,895,000	1.90	133,414	4.52
Kentucky	3	61,860,379	96,722,200	1.56	62,195	4.69
Illinois	4	55,948,199	112,095,000	2.00	64,266	5.57
Alabama	5	17,621,362	39,601,000	2.25	25,708	3.09
Indiana	6	16,378,580	29,212,000	1.78	16,806	6.51
Ohio	7	15,641,225	26,439,000	1.69	21,371	4.28
Virginia	8	11,900,933	20,375,000	1.71	12,312	4.28
Colorado	9	9,847,707	27,613,000	2.80	12,366	4.13
Wyoming	10	6,571,683	17,363,000	2.64	4,843	6.34
Tennessee	11	5,610,959	9,694,000	1.73	7,849	3.16
Utah	12	4,842,544	12,253,000	2.53	3,352	7.57
Missouri	13	3,732,421	9,637,000	2.58	5,964	3.47
Iowa	14	3,683,635	10,525,000	2.86	6,965	3.02
Total of U. S.		500,744,970	933,774,000	1.86	522,150	4.73

Coal is produced in 33 states, including Alaska, and it may be of interest to notice the production in the different geologic provinces into which these states are grouped. Figures are for 1928.

Province	*Tons*
Northern and Middle Appalachians (Pa., Ohio, Md., W. Va., eastern Ky., Va., Tenn.)	345,577,581
Southern Appalachians (Ala.)	17,621,362
Northern Interior (Mich.)	617,342
Eastern Interior (Ill., Ind., western Ky.)	88,603,995
Northern Western Interior (Iowa, Mo., Kan.)	10,225,780
Middle Western Interior (Ark., Okla.)	5,162,298
Southwestern Interior (Tex., bituminous)	117,849
Gulf Coast (Tex., lignite)	1,064,185
Northern Great Plains (N. Dak., lignite)	1,649,930
Rocky Mountains (Mont., Wyo., Colo., Utah, N. Mex.)	27,297,980
Pacific coast (Wash.)	2,519,901
Total for United States	500,744,970

GYPSUM

For a good many years the gypsum industry made consistent gains each year. But the current business—and mental—depression has naturally affected this industry and therefore the production both in Iowa and in the nation was less in 1928 than in either 1926 or 1927. Combined with the reductions in amounts was a price cutting war that resulted in a reduction in total value of sales.

It is worth while to take note of the variety of uses to which gypsum is being put—insulation; tile of various kinds, such as partition, to which it is very well adapted, roofing and special purposes; wall board and plaster board, which are being used in enormous amounts; and the various kinds of plasters. This great variety of uses is one of the factors that helps the industry keep active in periods of slow movement such as the present.

There were in Iowa seven active producers of gypsum and its

Gypsum Production in 1927 and 1928

	Iowa			
	1927		1928	
	tons	*value*	*tons*	*value*
Crude gypsum mined	792,159		764,044	
Sold crude—cement mills	138,375	$ 384,024	153,225	$ 239,227
agricultural	1,262	7,677	1,371	8,036
Total sold crude	139,637	391,701	154,596	247,263
Sold calcined—stucco	18,743	115,267		
neat and sanded plaster	379,702	2,711,701		
fibered plaster			253,114	1,197,374
sanded plaster			56,162	373,477
neat plaster			45,235	304,805
plaster of paris(a)	6,624	51,317	16,212	110,377
plaster and wall board	104,851	2,603,155	120,257(c)	2,471,806
partition tile	55,516	487,844	59,008	390,373
insulating, & c.(b)	18,869	352,512	15,152	259,739
Total sold calcined	584,305	6,321,796	565,140	5,107,951
Total sold	723,942	6,713,497	719,736	5,355,214
	United States			
Plants active	60		58	
Total mined	5,346,888		5,102,250	
Sold crude	965,371	$ 2,388,663	999,412	$ 1,902,034
Sold calcined	3,912,211	39,785,791	3,641,385	30,134,129
Total sales	4,877,582	42,174,454	4,640,797	32,036,163

(a) Includes: Sold to plate glass works, Keene's cement.
(b) Includes: Roofing tile, special tile, other building material.
(c) Equals 132,342,827 square feet, or 3,038 acres, 4.75 square miles.

products in 1928. One of these, the Hawkeye Gypsum Products Company of Fort Dodge, produces only crude gypsum. The six plants that calcine gypsum have 28 kettles with a daily capacity of 4,204 tons. The 51 plants in the United States have 182 kettles with a daily capacity of 22,350 tons and 15 rotary kilns with a capacity of 4,020 tons. This gives a total daily possible output of 26,370 tons.

LIMESTONE AND LIME

The stone industry in Iowa experienced a healthy growth in 1928, chiefly because of increase in the use of crushed rock for concrete and road metal and for agricultural purposes. This latter use is growing as farm lands are becoming impoverished and farmers are learning the advantages of liming their soils. The state's road building program likewise is helping the stone industry and doubtless will do so for many years to come now that everyone is learning to appreciate the benefits of better roads.

The following table shows the changes in output from the previous year. There are only two lime burning firms in the state, the Dubuque Stone Products Co., and the Hurst Estate, so the data regarding their product must be combined with those of other materials. Limestone was produced in forty-five states in 1928 and Iowa ranked fifteenth among these.

Production of Stone and Lime, 1927 and 1928

	1927		1928	
Kind	*tons*	*value*	*tons*	*value*
Building	3,160	$ 4,869	8,750	$ 13,000
Rubble			3,800	3,985
Riprap	124,400	123,321	106,790	87,586
Concrete and road metal	866,590	839,463	1,199,230	1,306,984
Ballast	105,140	93,773	112,040	109,160
Flux	9,550	12,146	6,840	9,767
Sugar fact., lime, etc.	5,536	38,392	10,417	28,736
Agriculture	163,680	156,069	207,660	180,770
	1,278,056	$ 1,267,033	1,666,270	$ 1,742,252
Stone in U. S.	99,662,270	112,439,824	96,864,650	110,231,974
Lime in U. S.	4,414,932	38,638,413	4,458,412	36,449,635

SAND AND GRAVEL

The production of sand increased in 1928 by 337,416 tons over that in 1927 and the value was $228,154 greater, a very gratifying increase. Production of building sand was 51,939 tons less, but the

Production of Limestone and Lime in Iowa in 1928

Counties	No. Producers	Building Stone, rubble, riprap(a)		Concrete, road metal (b)		Other uses (c)		Total	
		tons	*value*	*tons*	*value*	*tons*	*value*	*tons*	*value*
Appanoose(1), Decatur(1), Van Buren(1)	3	(d)		10,800	$ 16,670	5,680	$ 8,345	16,480	$ 25,015
Black Hawk(2), Fayette(1)	3	.....	.....	195,422	194,937	(d)	.....	195,422	194,937
Cerro Gordo(1), Mitchell(1) Winneshiek(2)	4	.....	.....	e	.....	43,715	61,229	43,715	61,229
Clayton	3	(d)	.....	77,014	65,479	.....	.....	77,014	65,479
Clinton(1), Jackson(1), Scott(2)	4	(d)	.....	249,690	219,245	73,810	62,212	323,500	281,457
Dubuque	4	(d)	.....	258,484	321,836	(d)	.....	258,484	321,836
Hardin (1), Marshall (2), Pocahontas (1)	4	(d)	.....	270,731	261,010	180,617	180,609	451,348	441,619
Johnson(1), Linn(2), Louisa(1)	4	.....	.....	183,900	229,190	(d)	.....	183,900	229,190
Jones	3	14,474	$16,047	23,597	23,698	12,280	10,746	50,351	50,491
Lee	3	(d)	.....	67,507	90,655	(d)	.....	67,507	90,655
Total for 1928	35	119,340	104,571	1,199,230	1,306,984	336,957	328,433	1,667,721	1,761,908
Total for 1927	30	127,560	128,190	866,590	839,463	283,906	299,380	1,278,056	1,267,033

(a) Includes: Rough building stone, 3 operators, 8,750 tons or 110,000 cu. ft., value $13,000; rubble, 5 operators, 3,800 tons, value $3,985; riprap, 11 operators, 106,790 tons, value $87,586.
(b) Total crushed stone sold was 1,311,270 tons, value $1,416,144.
(c) Includes: Railroad ballast and flux, 4 producers, 118,880 tons, value $118,927; agricultural stone, 18 producers, 207,660 tons, value $180,770, sugar factories, lime, other uses, 5 producers, 10,417 tons, value $23,736.
(d) Included with Concrete.
(e) Included with Other Uses.

output of paving sand was 285,403 tons greater, a fact that sufficed to bring the totals well above those for the preceding year.

In the case of gravel the story was somewhat different. The output in 1928 was 894,940 tons less than during the preceding year, but owing to higher prices the value received was $27,625 greater in 1928 than in 1927. Because of the combination of these circumstances the total output of sand and gravel in 1928 was 557,524 tons less while its value was $255,779 more than that of the year before.

Among the counties Polk was the leader in sand production with Cerro Gordo a close second and Muscatine third. In values, however, Muscatine was the leader, with Cerro Gordo second, Linn third, Wapello fourth and Polk fifth. In gravel production Cerro Gordo was easily the leader, with Muscatine second, Polk third and Sac a close fourth. In values Muscatine was slightly ahead of Cerro Gordo, Polk was third and Sac was fourth. In combined output Cerro Gordo was leader, Muscatine second best, Polk third and Butler fourth. The values differed here as in the separate classes. Muscatine led, Cerro Gordo was slightly behind, Polk was third and Butler ranked fourth. Cerro Gordo's material was used chiefly for paving, Muscatine's was used mostly for paving, although a good deal was used in buildings.

Summary of Sand and Gravel Production, 1927 and 1928

Materials	1927			1928		
	No. pits	*tons*	*value*	No. pits	*tons*	*value*
Sand						
Molding	3	14,522	$ 11,231	5	64,929	$ 43,667
Building	45	583,339	268,056	38	531,400	280,843
Paving	29	802,974	292,504	38	1,088,377	450,712
Grinding, polishing		(a)		3	14,087	31,789
Engine	9	34,171	18,102	10	35,608	17,163
Filter	4	13,378	17,714	1	(a)	
R. R. ballast	6	30,226	11,292	3	10,660	3,060
Other	6	17,772	25,551	3	88,737	45,370
Total sand	56	1,496,382	644,450	60	1,833,798	872,604
Gravel						
Building	36	362,512	338,950	38	341,533	333,079
Paving	36	1,793,420	725,986	43	1,013,941	790,344
R. R. ballast	13	324,916	129,220	12	228,529	83,703
Other	3	3,913	570	5	5,818	15,225
Total gravel	55	2,484,761	1,194,726	64	1,589,821	1,222,351
Total output	71	3,981,143	1,839,176	80	3,423,619	2,094,955

(a) Included in Other Sand.

Polk's output was more evenly divided, with paving material preponderating, and Butler's output was nearly all paving and roadmaking sand and gravel.

The output during 1927 and 1928 is shown by products in the summary which follows and the production is given by counties, so far as it can be shown, in the more extended tables.

Production of sand in the United States was 93,588,339 tons, valued at $54,291,398 in 1927, and 97,737,717 tons, valued at $56,132,406 in 1928. Gravel output in 1927 was 103,865,930 tons, valued at $61,238,388, and in 1928 it was 111,381,151 tons, valued at $63,075,531. These figures made a total tonnage of 197,454,269 in 1927 and 209,118,868 in 1928, with values of $115,529,786 in the former year and $119,207,937 in the latter year.

Production of Sand and Gravel in 1928—Sand

Counties	Producers	Structural sand		Paving sand		Other sand *a*		Total sand	
		tons	*value*	*tons*	*value*	*tons*	*value*	*tons*	*value*
Allamakee (1), Clayton (2), Fayette (1)	4	.....	.....	104,193	$ 65,022	(b)	.....	104,193	$ 65,022
Appanoose (1), Louisa (0), Mahaska (1), Wapello (1)	3	87,399	$ 53,175	143,154	69,523	(b)	.....	230,553	122,698
Black Hawk (2), Bremer (1), Tama (1)	4	56,064	37,895	(d)	.....	55,772	$ 31,762	111,836	69,657
Boone (2), Dallas (0), Marshall (1), Story (0)	3	18,307	10,291	.....	.....	(c)	.....	18,307	10,291
Buena Vista (0), Cherokee (1), Plymouth(1), Webster(1), Wright(0)	3	(b)	.....	55,636	18,500	.....	.....	55,636	18,500
Butler (3), Floyd (1), Franklin (1), Mitchell (1)	6	9,985	4,970	100,551	38,453	(b)	.....	110,536	43,423
Cerro Gordo	3	(b)	.....	207,272	93,658	7,858	3,021	215,130	96,679
Clinton (2), Jackson (1)	3	11,914	8,484	29,237	16,156	.....	.....	41,151	24,640
Des Moines (1), Lee (2)	3	(b)	.....	27,382	16,182	(b)	.....	27,382	16,182
Dickinson(0), Lyon(1), Osceola(0)	1	(f)	.....	.....	.....	.....	.....	(g)	
Dubuque (2), Scott (2)	4	36,000	27,025	64,394	17,896	.....	.....	100,394	44,921
Emmet (2), Humboldt (1) Palo Alto (1)	4	29,287	11,771	41,318	18,892	.....	.....	70,605	30,663
Johnson (1), Linn (2)	3	25,050	13,942	153,361	87,403	(b)	.....	178,411	101,345
Muscatine	5	45,297	22,093	115,694	31,567	33,432	52,278	194,423	105,938
Polk	6	86,514	29,357	130,321	38,062	(b)	.....	216,835	67,419
Sac	2	(e)	.....	(e)		.....	.....	(g)	.....
Sioux	3	(d)	.....	(d)	.....	89,635	35,025	89,635	35,025
Total	60	531,400	280,843	1,088,377	450,712	214,021	141,049	1,833,798	872,604
Totals for 1927	56	583,339	268,056	802,974	292,504	100,069	83,890	1,496,382	644,450

(a) Includes: Molding, cutting and grinding and blast, engine, filter, railroad ballast, and other sands.
(b) Included with paving sand.
(c) Included with structural sand.
(d) Included with other sand.
(e) Included with structural gravel.
(f) Included with paving gravel.
(g) Included with total sand and gravel.

Production of Sand and Gravel in 1928—Gravel

Counties	Producers	Structural gravel		Paving and other gravel (h)		Total sand and gravel		Total quantity washed	
		tons	*value*	*tons*	*value*	*tons*	*value*	*tons*	*value*
Allamakee (1), Clayton (1), Fayette (1)	3	.....	.....	27,850	$ 20,275	132,043	$ 75,297	120,583	$ 68,397
Appanoose (0), Louisa (1), Mahaska (1), Wapello (1)	3	(f)	.....	62,159	91,528	292,711	213,226	290,400	211,499
Black Hawk (2), Bremer (0) Tama (1)	3	11,082	$ 14,936	56,996	62,896	179,914	147,489	178,101	145,301
Boone (2), Dallas (1), Marshall (0), Story (1)	4	155,320	63,107	(e)	.....	173,647	112,098	(i)	.....
Buena Vista (1), Cherokee (1), Plymouth (1), Webster (1), Wright (1)	5	6,861	4,098	84,784	64,485	147,281	87,083	124,791	80,680
Butler (2), Floyd (0), Franklin (0), Mitchell (2)	4	(f)	.....	128,344	107,732	238,880	151,155	208,281	148,149
Cerro Gordo	3	(f)	.....	240,829	210,280	453,959	306,959	397,900	295,250
Clinton (3), Jackson (1)	4	35,603	29,475	79,500	54,591	156,254	108,706	130,854	84,968
Crawford (2), Harrison (1)	3	(f)	.....	40,420	12,815	40,420	12,815	.....	.....
Des Moines (1), Lee (2)	3	(f)	.....	12,800	14,675	40,182	30,857	(i)	.....
Dickinson (1), Lyon (2), Osceola (1)	4	(f)	.....	34,640	10,788	34,640	10,788	(i)	.....
Dubuque (2), Scott (2)	4	21,220	8,920	23,185	15,648	144,799	69,493	108,800	54,525
Emmet (2), Humboldt (1) Palo Alto (2)	5	7,104	5,857	45,096	19,358	122,805	55,878	67,197	30,277
Johnson (1), Linn (0)	1	(c)	.....	.....	.....	178,411	101,345	178,411	101,345
Muscatine	5	51,471	50,270	165,781	160,225	411,675	316,433	411,675	316,433
Polk	5	52,662	59,434	110,100	62,825	379,597	189,688	379,083	189,358
Sac	3	102,823	54,923	56,343	13,451	159,166	68,374	(i)	
Sioux	3	(f)	.....	47,600	39,950	137,235	74,975	(i)	.....
Undistributed		.....	.....	.....	.....	.....	.....	251,517	147,258
Total	64	341,533	333,079	1,248,288	889,272	3,423,619	2,094,955	2,847,553	1,873,539
Totals for 1927	55	362,512	338,950	2,122,249	855,776	3,981,143	1,839,176	2,419,280	1,340,037

(c) Included with structural sand.
(e) Included with structural gravel.
(f) Included with paving gravel.
(h) Includes: Paving and roadmaking, railroad ballast, other gravels.
(i) Included in undistributed.

MINERAL PRODUCTION IN 1929*

OUTLINE

The mineral industry showed slight gains in 1929, the improvements being in making of clay wares, in coal production and in the recovery of sand and gravel. Shipments of cement decreased somewhat and the value received was $953,679 less than during 1928. The gypsum industry also was unable to equal the level of production reached in 1928, even though that was lower than that of 1927. The production of stone and lime also was somewhat lower than in 1928. However, these items balanced each other sufficiently to make a slight increase in the total value of the output. The coal operators of the state are making a determined effort to win back the prestige and the markets lost to them during the strike of 1927 and the upward trend in the figures attests at least moderate success. Clay products also increased notably.

Value of mineral products the country over was 8 per cent greater than in 1928. The following figures summarize production during these two years.

	1928	1929
Metallic	$1,284,580,000	$1,475,900,000
Nonmetallic except fuels	1,206,158,000	1,141,000,000
Mineral fuels	2,884,962,000	3,202,000,000
Others	9,200,000	11,100,000
Total	$5,384,900,000	$5,830,000,000

* Statistics are collected by the U. S. Bureau of Mines, co-operating with the Iowa Geological Survey, except in the case of clay wares, which are gathered by the Bureau of the Census.

Mineral Production in Iowa in 1928 and 1929

Product	Unit	1928			1929		
		Producers	*quantity*	*value*	Producers	*quantity*	*value*
Cement	bbl	6	6,880,731	$10,734,838	6	6,586,111	$9,781,159
Clay wares		55		5,048,774	42		5,791,175
Coal	ton	222	3,683,635	10,525,000	201	4,241,069	11,948,000
Gypsum	ton	7	719,736	5,355,214	8	670,203	4,668,856
Limestone and lime	ton	35	1,666,270	1,742,252	41	1,625,000	1,560,066
Sand and gravel	ton	80	3,423,619	2,094,955	80	4,043,609	2,211,752
				$35,501,033			$35,961,008

CEMENT

Production of Cement in Iowa in 1928 and 1929

	1928	1929
Production, bbls.	7,070,172	6,373,330
Stock, Dec. 31, bbls.	1,559,925	1,347,144
Shipments, bbls.	6,880,731	6,586,111
Shipments, value	$10,734,838	$9,781,159
Average price per bbl.	$1.56	$1.49
Est. consumption, bbls.	5,348,807	5,462,534
Est. consumption per cap., bbls.	2.20	2.25
Surplus production, bbls.	1,531,924	1,123,577
Annual capacity, bbls.	9,593,000	9,592,900

The table given above shows that the cement industry experienced a slight decline during 1929 in practically all phases. Production was much less than in 1928, shipments were also less, and owing to lower factory prices the amount received was nearly a million dollars less in 1929. This, in face of the road building in progress, seems to indicate that other construction was slowing down, with resulting smaller demand for cement. That these conditions were prevalent the country over is suggested by the following data:

Production of Cement in the United States

	1928	1929
Production, bbls.	176,298,846	170,646,036
Shipments, bbls.	175,838,332	169,868,322
Shipments, value	$275,972,945	$252,153,789
Stocks, Dec. 31, bbls.	22,760,103	23,537,817
Plants active	156	163

In the district including eastern Missouri, Iowa, Minnesota and South Dakota, in which 12 plants were active each year, shipments

amounted to 16,544,026 barrels, valued at $25,777,858, in 1928, and to 15,984,176 barrels, with a value of $23,430,891, in 1929.

The Pennsylvania-Dixie Cement Corporation bought the plant of the Pyramid Cement Company at Valley Junction April 1, 1928, and changed the name of the plant to its own a year later. The companies now operating in Iowa are the following:

Davenport, Dewey Portland Cement Co., Kansas City, Mo.
Brand—Dewey.
Des Moines, Hawkeye Portland Cement Co., Des Moines.
Brand—Hawkeye.
Gilmore City, Northwestern States Portland Cement Co., Mason City.
Brand—Northwestern.
Mason City, Lehigh Portland Cement Co., Allenton, Pa.
Brand—Lehigh.
Northwestern States Portland Cement Co., Mason City.
Brand—Northwestern.
Valley Junction, Pennsylvania-Dixie Cement Corporation, Des Moines.
Brand—Pyramid.

CLAY PRODUCTS

The Bureau of the Census has decided that it can not furnish the State Geological Surveys with any detailed statistics regarding production of clay wares in their states, or even any lists of producers. Therefore the only information that is so far available regarding production in 1929 is that given in the following brief summary, which as usual was supplied by the Bureau of the Census.

Number of establishments	42
Number of wage earners, average	1,670
Wages	$1,903,722
Cost of materials, fuel and purchased electric current	$1,516,737
Value of products	$5,791,175

As compared with a production in 1928 valued at $5,048,774 this summary shows a substantial gain in value of output. Nothing is known, however, as to the distribution of this increase among the different classes of ware. The Bureau of Mines reported 3,200 tons of raw clay sold at a value of $23,281. How much of this duplicates the figure given for the total output is not known.

Production of clay wares in the United States during the past two years was as follows:

Products	1928	1929
Common brick	$ 69,332,912	$ 60,181,451
Vitrified brick	7,800,090	7,281,681
Face brick	40,034,273	35,787,363
Other brick	1,506,077	1,711,052
Terra cotta	13,641,777	14,587,911
Hollow ware	25,791,634	30,121,712
Flue lining	2,693,098	2,482,141
Tile	31,523,096	22,009,133
Drain tile	5,256,220	6,542,821
Sewer pipe	23,968,773	21,421,897
Stove lining	343,907	468,248
Fire brick	37,391,735	42,699,145
Glass melting pots, etc.	1,993,609	2,276,009
Wall coping	663,131	486,664
Miscellaneous	3,830,181	4,609,180
Total	$265,770,513	$264,560,411
Pottery	107,780,369	
Grand total	373,550,882	
Clay sold	14,200,739	14,850,744

The following list of clay plant operators was furnished this Survey by the Bureau of Census before it decided not to furnish such lists.

Adel Clay Products Co., Adel, Dallas county.
Art Novelty Pottery Co., Waterloo, Black Hawk county.
Audubon Brick & Tile Works, Audubon, Audubon county.
Ballou Brick Co., Sergeant Bluff, Woodbury county; office 200 United Bank Bldg., Sioux City.
Bellevue Clay Products Co., Bellevue, Jackson county.
Centerville Clay Products Co., West Van Buren St., Centerville, Appanoose county.
Clermont Brick & Sand Co., Clermont, Fayette county.
Crystal Spring Clay Co., Kimballton, Audubon county.
Deep River Brick & Tile Co., Deep River, Poweshiek county.
Des Moines Clay Co., 908 Walnut St., Des Moines, Polk county.
Garrison Brick & Tile Works, Garrison, Benton county.
Gethmann Brick & Tile Co., Gladbrook, Tama county.
Gladbrook Pressed Brick Co., Gladbrook, Tama county.
Goldfield Clay Works, Goldfield, Wright county.
Goodwin Tile & Brick Co., S. E. 18th & Hartford Sts., Des Moines, Polk county; office 410 Shops Building.
Goss Brick Yard, N. Dodge Street, Iowa City, Johnson county.
Gould, G. O., Belle Plaine, Benton county.
Green Brick Co., 4200 Correctionville St., Sioux City, Woodbury county.
Hedrick Tile Works, Hedrick, Keokuk county.
Heim, John G., Brick Co., West 32d St., Dubuque, Dubuque county; office 2444 Broadway.
Iowa Pipe & Tile Co., Inc., E. 4th & Hayes Sts., Des Moines, Polk county.
Iowa Tile & Brick Co., Knoxville, Marion county.
Iowa Tile Works, Box 108, Davenport, Scott county.
Johnston Clay Works, Inc., First National Bank Bldg., Ft. Dodge, Webster county.
Kalo Brick & Tile Co., Snell Bldg., Ft. Dodge, Webster county.
Lehigh Sewer Pipe & Tile Co., Lehigh, Webster county; office 1526 Fifth Ave. North.
Lynnville Brick & Tile Works, Lynnville, Jasper county.
Mason City Brick & Tile Co., Inc., 19 W. State St., Mason City, Cerro Gordo county.
Maxwell Brick & Tile Co., Maxwell, Story county.
Meyer, Peter, New Sharon, Mahaska county.
Morey Clay Products Co., Ottumwa, Wapello county.

National Clay Products Co., 4th St. S. W., Mason City, Cerro Gordo county; office Box 424.
Nelson, John A., Clay Products Co., What Cheer, Keokuk county.
Nevada Brick & Tile Works, West Lincoln Way, Nevada, Story county; office Box 564.
North Iowa Brick & Tile Co., Inc., 19 West State St., Mason City, Cerro Gordo county.
Packwood Clay Tile Works, Packwood, Jefferson county.
Plymouth Clay Products Co., 20th St. & 15th Ave. South, Ft. Dodge, Webster county; office 1420 7th Ave. N., Ft. Dodge.
Postville Tile Works (Tuthill Bldg. Material Co.), Postville, Allamakee county: office 131 W. 63d St., Chicago, Illinois.
Redfield Brick & Tile Co., Inc., Redfield, Dallas county.
Reinbeck Pressed Brick Co., Reinbeck, Grundy county.
Rockford Brick & Tile Co., Rockford, Floyd county.
Roggentine Tile Factory, R. R. No. 4, Williamsburg, Iowa county.
Sheffield Brick & Tile Co., Sheffield, Franklin county.
Sioux City Brick & Tile Co., North Riverside St., Sioux City, Woodbury county; office 200 United Bank Bldg., Sioux City.
Standard Clay Products Co., Harvey, Marion county; office Third Ave. East, Oskaloosa, Mahaska county.
Standard Clay Products Co., Third Ave. East, Oskaloosa, Mahaska county.
Stockport Brick & Tile Co., Stockport, Van Buren county.
United Brick & Tile Co., Adel, Dallas county; office Lee Bldg., Kansas City, Mo.
United Brick & Tile Co., Plant No. 1, Boone, Boone county; office as above.
United Brick & Tile Co., Plant No. 33, Carlisle, Warren county; office as above.
United Brick & Tile Co., Plant No. 7, Creston, Union county; office as above.
United Brick & Tile Co., Plant No. 2, Des Moines, Polk county; office as above.
United Brick & Tile Co., Plant No. 5, Van Meter, Dallas county; office as above.
United Brick & Tile Co., Plant No. 3, Des Moines, Polk county; office as above.
United Brick & Tile Co., Plant No. 4, Des Moines, Polk county; office as above.
Vincent Clay Products Co., Inc., Ft. Dodge, Webster county; office 617 First Nat. Bank.
Washington Brick & Tile Works, Washington, Washington county.
What Cheer Clay Products Co., What Cheer, Keokuk county.
Wickham's Brick Yard, North 8th St., Council Bluffs, Pottawattamie county; office 19 Scott St.
Winfield Brick & Tile Co., Winfield, Henry county.

COAL

Comparison of the table that follows with the summary figures for 1928 will show that the Iowa coal industry made a long stride toward regaining the place it held a few years ago. Both tonnages and values increased largely, despite a slightly lower average price. This increase was reflected in the larger number of men who received employment and in the number of days they worked. They must not have worked quite so industriously, however, for the tonnage per man declined a little from its 1928 position.

Among the counties Marion retained leadership, although with a smaller output and a lessened margin. Polk, which had been second in 1928, dropped to third place in 1929, both because of slightly lower production and because of the larger output of Appanoose, which rose to second place. Polk, however, did retain second place in value re-

ceived. Monroe advanced notably, in both absolute output and relative standing. A number of other counties also showed noteworthy improvement.

The following table is taken from the report of the Mine Inspectors for the biennial period ending December 31, 1929. It is of interest because it includes the smaller mines which do not report to the federal Bureau of Mines.

Counties	Mines		Tonnage		Employees	
	1928	1929	1928	1929	1928	1929
Adams	7	8	13,259	18,128	75	82
Appanoose	70	63	484,250	588,029	1,440	1,688
Boone	9	11	399,458	483,401	873	967
Dallas	4	4	273,470	419,397	593	668
Davis	2	2	3,220	2,917	13	13
Greene	3	3	4,918	7,069	19	23
Guthrie	7	6	8,901	9,409	51	50
Jasper	8	7	44,964	57,525	100	118
Jefferson	2	2	1,829	3,486	12	21
Lucas	5	8	327,447	442,471	408	634
Mahaska	30	30	58,678	56,741	176	204
Marion	25	33	858,634	795,671	965	1,057
Monroe	17	17	361,848	518,294	732	759
Page	5	4	20,560	20,236	82	90
Polk	19	20	591,752	569,681	953	898
Taylor	3	3	15,370	8,828	55	66
Van Buren	7	7	11,175	13,333	40	42
Wapello	29	27	87,184	103,814	240	251
Warren	6	8	163,290	202,063	288	375
Wayne	5	6	20,304	15,370	70	89
Webster	4	2	9,036	1,150	29	8
Totals	267	271	3,759,545	4,337,013	7,214	8,103
Local mines	214	217	697,829	738,528	2,052	2,266
Shipping mines	60	54	3,061,716	3,598,485	5,162	5,837
Mining machines	80	103				
Horses and mules	572	607				

Final figures of production in the United States during 1929 indicate that the tonnage of anthracite recovered was 73,828,195, with a value of $385,643,000. Tonnage of bituminous was 534,988,593, valued at $952,781,000. Total amount was 608,816,788 tons, valued at $1,338,424,000.

*Production, Value, Men Employed, Days Worked, and Output per Man per Day at Coal Mines in Iowa in 1929**
(Exclusive of product of wagon mines producing less than 1,000 tons)

County	Producers	Net tons				Value		Number of employees					Average number of days worked	Average tons per man per day
		Loaded at mines for shipment	Sold to local trade and used by employees	Used at mines for power and heat	Total quantity	Total	Average per ton	Underground			Surface	Total		
								Miners, loaders, and shot firers	Haulage and track	All others				
Adams	5	.....	11,332	1,800	13,132	$ 40,000	$ 3.05	25	3	2	4	34	189	2.04
Appanoose	51	492,370	75,584	1,360	569,314	1,542,000	2.71	1,189	116	92	128	1,525	151	2.47
Boone	7	407,395	72,088	4,107	483,590	1,479,000	3.06	688	72	89	48	897	206	2.61
Dallas	4	404,498	13,260	1,638	419,396	1,170,000	2.79	433	49	55	37	574	206	3.55
Greene and Webster	4	.....	3,777	.....	3,777	15,000	3.97	15	2	2	3	22	71	2.42
Guthrie	6	.....	10,609	.....	10,609	42,000	3.96	30	2	4	4	40	154	1.72
Jasper	6	.....	54,122	4,505	58,627	165,000	2.81	77	10	11	18	116	151	3.36
Jefferson	3	.....	3,676	.....	3,676	9,000	2.45	10	1	1	1	13	158	1.79
Lucas	4	425,592	4,543	9,902	440,037	1,324,000	3.01	400	71	105	42	618	197	3.61
Mahaska	25	.....	48,616	139	48,755	126,000	2.58	120	4	6	9	139	148	2.37
Marion	17	709,563	54,109	16,995	780,667	2,255,000	2.89	694	97	124	53	968	229	3.53
Monroe	10	483,926	25,926	3,167	513,019	1,251,000	2.44	546	69	51	54	720	229	3.11
Polk	14	269,259	282,075	9,116	560,450	1,596,000	2.85	639	102	69	68	878	222	2.87
Taylor	3	358	8,470	.....	8,828	36,000	4.08	34	4	2	2	42	120	1.75
Van Buren	4	3,619	6,103	75	9,797	27,000	2.76	18	2	1	2	23	168	2.53
Wapello	20	158	77,021	235	77,414	215,000	2.78	137	11	10	16	174	138	3.22
Warren	6	184,888	13,594	4,200	202,682	519,000	2.56	270	29	56	35	390	219	2.37
Wayne	5	2,175	13,095	.....	15,270	48,000	3.14	53	5	7	8	73	114	1.83
Other counties (Davis, Keokuk, and Page)	6	.....	22,029	.....	22,029	89,000	4.04	30	6	6	7	49	133	3.38
Totals for 1929	201	3,383,801	800,029	57,239	4,241,069	11,948,000	2.82	5,408	655	693	539	7,295	195	2.98
Totals for 1928	222	2,849,348	781,390	52,897	3,683,635	10,525,000	2.86	5,055	766	644	500	6,965	175	3.02

* The figures relate only to active mines of commercial size that produced coal in 1929. The number of such mines in Iowa was 201 in 1929; 222 in 1928; and 183 in 1927.

Methods of mining in 1929: The tonnage by hand was 489,369; shot off the solid, 2,416,232; cut by machines, 1,282,612; not specified, 52,856.

Size classes of commercial mines in 1929: There were 5 mines in Class 1 B (200,000 to 500,000 tons) producing 32.6 per cent of the tonnage; 7 in Class 2 (100,000 to 200,000 tons) with 24.0 per cent; 8 in Class 3 (50,000 to 100,000 tons) with 14.7 per cent; 34 in Class 4 (10,000 to 50,000 tons) with 20.3 per cent; 147 in Class 5 (less than 10,000 tons) producing 8.4 per cent.

The following firms produced coal during 1928 and 1929.

Adams County
- Aukeny Coal Co., Villisca
- Black Diamond Coal Co., Route 1, Nodaway
- John G. Henton, R. F. D. 1, Carbon
- Larson & Turner, Route 6, Corning
- McKee Coal Co., R. 6, Carbon
- J. F. Ruth & Son, Carbon
- Smith Coal Co., Carbon
- Wild Coal Co., Carbon

Appanoose County
- Appanoose County Coal Co., Centerville
- Armstrong Coal Co., Cincinnati: office Commerce Bldg., Kansas City, Mo.
- Battle Creek Coal Co., Route 2, Mystic
- Big Slope Coal Co., Route 3, Centerville
- Bradshaw Coal Co., Dean
- Buban Coal Co., Route 1, Mystic
- Byte Coal Co., Route 3, Centerville
- Caldwell Coal Co., Exline
- Center Coal Co., Centerville
- Centerville Block Coal Co., Centerville
- Centerville Coal Co., Centerville
- Citizens Coal Co., Centerville
- Clarke Coal Co., Centerville
- J. A. Colgan Coal Co., Mystic
- Columbus Coal Co., Centerville
- Commercial Coal Co., Mystic
- Diamond Lump Coal Co., Centerville
- Domestic Coal Co., Cincinnati
- Duff Coal Co., Mystic
- Empire Coal Co., Centerville
- Enterprise Coal Co., Numa
- Fairlawn Coal Co., Centerville
- Friendship Coal Co., Cincinnati
- Garfield Coal Co., Centerville
  W. M. Evans, Tr. in Bankruptcy
- Guinn Coal Co., Coal City
- Hafner Coal Co., Cincinnati
- Happy Hollow Coal Co., Route 2, Cincinnati
- Helman Bros. Coal Co., Centerville
- Herr Coal Co., Plano
- Hi-Test Coal Co., Mystic
- Iowa Block Coal Co., Centerville
- Jerome Coal Co., Jerome
- Kincaide Coal Co., Centerville
- J. A. Koontz, Centerville
- Liberty Coal Co., Mystic
- Little Walnut Coal Co., Mystic
- W. W. Lowe, Brazil
- Maddalozzi Coal Co., Mystic
- McConville Coal Co., Centerville
- Monitor Coal Co., Centerville
- New Barrett Coal Co., Mystic
- New Egypt Coal Co., Mystic
- New Rock Valley Coal Co., Centerville
- New Star Coal Co., Route 1, Centerville
- North Hill Coal Co., Centerville
- Numa Coal Co., Numa
- Old King Coal Co., Centerville
- Peacock Coal Co., Brazil
- Prospect Coal Mine, J. F. Daniels, Exline
- Rathbun Coal Co., Rathbun
- Red Bird Coal Co., Seymour
- Rock Valley Coal Co., Centerville
- J. Rosenbaum & Son, Centerville
- Simatovich Coal Co., Dan Simatovich, Route 3, Centerville
- Star Coal Co., Mystic
- Sunshine Coal Co., Centerville
- Thistle Coal Co., Cincinnati
- J. A. Truby, Route 1, Mystic
- Walnut Creek Coal Co., Jerome
- Water Lily Coal Co., V. Blazina & Son, Rathbun
- White Oak Coal Co., Exline

Boone County
- Benson Coal Co., Boone
- Boone Coal Co., Inc., Boone
- Fort Dodge, Des Moines & Southern R. R. Co., Ogden
- Kennedy & Blosser, Ogden
- Kristianson Bros., Route No. 1, Ogden
- Scandia Coal Co., Madrid: office 606 Grand Ave., Des Moines
- Spring Valley Coal Co., Boone

Dallas County
- Dallas Fuel Co., Granger: office Insurance Exchange Bldg., Des Moines
- Norwood-White Coal Co., Moran: office 907 Bankers' Trust Bldg., Des Moines
- Scandia Coal Co., Des Moines
- Shuler Coal Co., Waukee: office So. Surety Building, Des Moines

Davis County
- Henderson & Goodwin Coal Co., Floris
- Lunsford Bros. Coal Co., Bloomfield
- Mitchell Bros. Coal Co., R. F. D. No. 2, Floris
- Van Patten Coal Co., Floris

Greene County
- Creek Side Coal Co., Dawson
- Harold McElheny Co., Rippey
- Riverside Coal Co., Rippey

Guthrie County
- Butler Coal Co., Guthrie Center
- Mallon Coal Co., Guthrie Center
- John Mansell Coal Co., Guthrie Center
- Elmer Renslow Coal Co., Guthrie Center
- W. H. Scott, R. R. No. 5, Guthrie Center

H. M. Sipe Coal Co., Guthrie Center
Thomas Coal Co., Guthrie Center

Jasper County

Colfax Coal Co., Colfax
Hopkins Coal Co., Colfax
Jackson Coal Co., R. F. D. 4, Newton
Marshall Coal Co., Monroe
McKeevers Coal Co., Colfax
McSeel Coal Co., Colfax
Newton Coal Co., Newton
Merl Stines, R. F. D. No. 3, Monroe

Jefferson County

Bonnett Coal Co., Fairfield
R. B. Cross, R. 2, Birmingham
Star Coal Co., R. F. D. 7, Fairfield

Keokuk County

Carson Bros., What Cheer
Clive Coal Co., Delta

Lucas County

Cedar Coal Co., Route 4, Melrose
Central Iowa Fuel Co., Williamson: office 1209 So. Surety Bldg., Des Moines
Consolidated Indiana Coal Co., Melcher: office 139 West Van Buren St., Chicago, Ill.
Mederais Coal Co., R. 1, Lacona
Union Coal Co., John T. Griffith, Box 131, Lucas

Mahaska County

Charles Ahrweiler, Oskaloosa
Ball & Co., What Cheer
Blomgren Bros. Coal Co., R. F. D., Lovilia
Cromwell & Wilson, Givin
De Frehn & Son, Oskaloosa
Eddy Coal Co., Beacon
Edwards Bros. Coal Co., Oskaloosa
A. M. Ellis Coal Co., Givin
Evans Bros. Coal Co., Eddyville
Evans Coal Co., Evans
Fedro Coal Co., R. F. D., Givin
Steve & Joe Gasper, Truax
Givin Coal Co., Givin
G. A. Hausel Coal Co., Rose Hill
Hynick Coal Co., R. R. 1, Givin
Thomas Lewis, Givin
Mathes Coal Co., Givin
Mitchell Coal Co., 902 1st Ave. W., Oskaloosa
J. M. Mitrisin, Oskaloosa
O'Brien & Edwards, Beacon
Oskaloosa Coal Co., Oskaloosa
Owens & Griffith, Beacon
Henry Pool, Oskaloosa
Roberts Bros. Coal Co., Oskaloosa
Swanson & Hohn Coal Co., Oskaloosa
Sweitzer Coal Co., Eddyville
Thatcher Coal Co., Oskaloosa
White & Ferguson, Rose Hill
Williams Coal Co., New Sharon
Woodward & Boggs Coal Co., Oskaloosa

Marion County

Bishop Coal Co., R. F. D., Knoxville
Bradley Bros. Coal Co., R. 1, Knoxville
Cedar Creek Coal Co., Bussey
Consolidated Indiana Coal Co., Melcher: office 139 West Van Buren St., Chicago, Ill.
Cox Bros., R. 3, Knoxville
Charles Fortner Coal Co., R. F. D., Knoxville
Hamilton Coal Co., Hamilton
Hayes Bros. Coal Co., Knoxville
Horse Shoe Coal Co., Dupont & Villont, Bussey
Roy Hudson Coal Co., R. 8, Knoxville
Johns Bros. Coal Co., Bussey
C. C. Kendall Coal Co., Marysville
Arthur Lockhart Coal Co., R. F. D., Oskaloosa
Mayer Coal Co., Harvey
McAllister & Gilcrest, Dallas
Walter McElrea, Dallas
Pershing Coal Co., Pershing: office 648, Ins. Exch. Bldg., Des Moines
John Miller & Sons, Pleasantville
W. L. Nail Coal Co., Knoxville
J. W. Newton, Dallas
Riggens Coal Co., Harvey
Red Rock Coal Co., Melcher: office 1219 So. Surety Bldg., Des Moines
Ben Rowley, Knoxville
Success Coal Co., Otley
Swan Coal Co., Swan
Vanceunebrak Bros. Coal Co., Knoxville

Monroe County

Blackstone Coal Co., R. F. D. 1, Lovilia
Carbon Coal Co., Albia
City Coal Co., Albia
De Ross Coal Co., Route 3, Albia
Federal Coal Co., Route 3, Albia
Graham Coal Co., Avery
Hocking Coal Co., Hocking
Independent Coal Co., J. H. Homerin, Albia
Lovilia Coal Co., Lovilia
Monroe Block Coal Co., Albia
Oak Block Coal Co., W. J. Gragg, R. 6, Albia
Plainview Coal Co., Albia
Rex Fuel Co., Albia
Smoky Hollow Coal Co., Albia

Page County

Clarinda Coal Co., Clarinda
Evans Coal Co., Clarinda
Pearson Coal Co., Clarinda
Sawmill Coal Co., Clarinda

Polk County
Adelphi Coal & Mining Co., Adelphi: office 2300 East 24th St., Des Moines
Beck Coal & Mining Co., Des Moines
Bennett Bros. Coal Co., Des Moines
Carbon Mining Co., 907 Bankers Trust Bldg., Des Moines
Clover Leaf Coal Co., Des Moines
Commerce Coal Co., Commerce
Des Moines Coal Co., Valley Nat'l Bank Bldg., Des Moines
Des Moines Ice & Fuel Co., Des Moines
Economy Coal Co., Des Moines
Gibson Coal Co., Rider: office 225 Iowa Bldg., Des Moines
Independent Coal Co., Des Moines
Norwood-White Coal Co., Herrold: office, Des Moines
Preston Coal Co., Carlisle
Spring Valley Coal Co., Boone
Standard Coal Co., 2456 East Grand Ave., Des Moines
Robert Stanford Coal Co., Des Moines
Urbandale Coal Co., Des Moines

Taylor County
Bean Coal Co., New Market
Carbon Coal Co., S. Osborn, New Market
New Market Coal Co., New Market
Richardson Coal Co., Gravity

Van Buren County
Blue Jacket Coal Co., Clark Bourland, Farmington
A. Carmichael, Birmingham
J. Daniels & Sons, Douds
Greer & Sons Coal Co., Mt. Zion
Ratcliff Coal Co., Douds

Wapello County
Airline Coal Co., 415 S. Willard St., Ottumwa
Best Coal Co., William Rogers, R. F. D., Ottumwa
Big Four Coal Co., Ottumwa
Blakesburg Coal Co., Ottumwa
Carr Brothers Coal Co., Eldon
J. W. Dawson, Kirksville
Gibbs Bros. Coal Co., R. F. D., Ottumwa
Glendale Coal Co., 1317 Castle St., Ottumwa
Happy Hollow Coal Co., R. F. D., Ottumwa
Hartwig Bros. Coal Co., Eldon
Indian Head Coal Co., Ottumwa
L. A. Keller Coal Co., R. F. D. 5, Ottumwa
Kirkville Coal Co., Lipovac & Hoover, Ottumwa
Lafayette Coal Co., 1024 West 2d St., Ottumwa
Larkin Coal Co., R. F. D. 4, Ottumwa
Miers & Houk Coal Co., R. F. D. 8, Ottumwa
Munterville Coal Co., Blakesburg
Henry Rowley, R. 3, Blakesburg
Santen Coal Co., R. F. D. 3, Blakesburg
Sickles Coal Co., Eldon
Simpson Bros. & Howard, Ottumwa
Stribling Coal Co., Eldon
Thode Coal Co., R. F. D., Blakesburg
Union Coal Co., Ottumwa
Utterback Coal Co., R. F. D. 8, Ottumwa
Wapello Coal Co., Ottumwa
Weist Coal Co., Eldon

Warren County
Roy Carpenter, Lacona
Great Western Coal Co., Orillia: office Polk Bldg., Des Moines
Indian Valley Gloss Coal Co., Hartford: office Ins. Exch. Bldg., Des Moines
Lanti Miller Coal Co., Lacona
Oak Hill Coal Co., Carlisle
Ridge Block Coal Co., Carlisle
Scotch Ridge Coal Co., R. F. D., Carlisle

Wayne County
L. E. Bennett, R. 2, Promise City
Hayhurst Coal Co., R. 2, Promise City
Rissler & Yocum, Promise City
Violet Valley Coal Co., Seymour
Whalen Coal Co., Seymour

Webster County
A. Munson Coal Co., Lehigh

GYPSUM

The mining of crude gypsum and the sales of crushed unburned gypsum both were less in 1929 than in 1928, and the output of calcined and processed gypsum was somewhat less also. More fibered plaster and boards were sold, but in the case of the latter the price received was less. Some of the apparent discrepancies in figures for the past three years are no doubt due to differences in classification.

Iowa operated 27 kettles in 1929 as against 28 in 1928, but the total capacity is given as 4,444 tons compared with 4,204 tons the year before.

Producers in recent years were these:

Federal Gypsum Co., Centerville (Now U. S. Gypsum Co.).
Certainteed Products Corp., Fort Dodge. Office 100 E. 42d St., New York.
Universal Gypsum & Lime Co., Fort Dodge. Offices 1535 Conway Bldg., Chicago.
United States Gypsum Co., Fort Dodge. Offices 300 W. Adams St., Chicago.
Hawkeye Gypsum Products Co., Fort Dodge.
Johnson Clay Works, 214 First Nat. Bank Bldg., Fort Dodge.
Wasem Plaster Co., Warden Apts., Fort Dodge.
Cardiff Gypsum Plaster Co., 903 Central Ave., Fort Dodge.

Production of Gypsum in 1928 and 1929

	1928		1929	
	tons	*value*	*tons*	*value*
Crude gypsum mined	764,044		718,503	
Sold crude—cement mills	153,225	$ 239,227	147,330	$ 232,846
Agriculture	1,371	8,036	1,112	5,888
Total sold crude	154,596	247,263	148,442	238,734
Sold calcined—neat and sanded plaster	101,397	678,282	39,114	208,416
Fibered plaster	253,114	1,197,374	276,033	1,276,645
Plaster board and wall board	120,257 (c)	2,471,806	126,018 (c)	2,240,024
Partition tile	59,008	390,373	54,468	356,160
Other building(a)	15,152	259,739	17,173	274,823
Plaster of paris(b)	16,212	110,377	8,955	74,054
Total sold calcined	565,140	5,107,951	521,761	4,430,122
Total sold	719,736	5,355,214	670,203	4,668,856

(a) Includes: Roofing tile, special tile, insulating, fireproofing, other building material.
(b) Includes: Keene's cement, sold to plate glass works.
(c) 1928: Equals 132,342,827 square feet, or 3,038 acres, or 4.75 square miles. 1929: 151,961,741 square feet, or 3,489 acres, or 5.45 square miles.

The table following shows that production in the United States dropped a little from that of 1928, although the amount sold crude was somewhat larger. Amounts and values of neat and sanded plaster were considerably less, but amounts and values of boards and lath were notably larger.

Production of Gypsum in the United States in 1929

	Plants	Mined	Sold Crude		Sold Calcined		Total Value
		tons	*tons*	*value*	*tons*	*value*	
Iowa	8	718,503	148,442	$ 238,734	521,761	$ 4,430,122	$ 4,668,856
Michigan	5	898,547	213,657	299,249	481,872	4,016,085	4,315,334
Nevada	5	225,514	43,815	131,735	148,640	1,159,119	1,290,854
New York	11	1,284,338	298,793	707,644	859,147	7,632,208	8,339,852
Ohio	3	374,008	12,190	30,696	356,734	3,270,744	3,301,440
Oklahoma	3	369,433	b		b		2,255,874
Texas	4	520,519	29,991	47,836	416,276	3,392,451	3,440,287
Others(a)	20	625,270	318,809	640,885	577,150	5,295,461	3,680,972
Total	59	5,016,132	1,065,697	2,096,779	3,361,580	29,196,190	31,292,969
1928	58	5,102,250	999,412	1,902,034	3,641,385	30,134,129	32,036,163

(a) Includes: Arizona, California, Colorado, Kansas, Montana, New Mexico, South Dakota, Utah, Virginia, Wyoming.
(b) Included in Others.

An interesting development of the year was the discovery by the Bureau of Mines that anhydrite in very fine form dissolves in water about as fast as gypsum. Hence in this condition it can be used as retarder in cement. (Pit and Quarry, Jan. 1, 1930.) White cements of excellent cementing powers have been made from anhydrite also. (Rock Products, vol. 33, Jan. 4, 1930, p. 111.) Flexible wall board and lath have been perfected recently and several other new products have been made public.

LIMESTONE AND LIME

The tables which follow show a slight reduction in the amount of stone marketed in 1929 and a somewhat greater reduction in its value as compared with that produced in 1928. This lessened output was shared by every important branch of the industry, even the classes of crushed stone—for concrete, ballast, agriculture, etc.—being produced in lessened amounts. And these are much the most important elements in Iowa's stone trade. Other construction materials—rough stone for building and riprap for river improvement and similar projects—stand next in order of value.

Only one lime plant was operated, that of the Hurst estate at Hurstville. The Dubuque Stone Products Co. dismantled its kilns in December, 1928, thus terminating an operation of many years standing.

Scott was the leading county during this year with Marshall, Madi-

son, Hardin, Black Hawk, and Johnson following in order among the leaders. Among individual producers the Linwood Cement Co. of Scott county was the foremost, while the River Products Co. of Johnson county stood next. This of course does not include the materials extracted by the cement companies for their own manufacturing purposes.

Production of Stone and Lime, 1928 and 1929

Kind	1928			1929		
	Plants	*tons*	*value*	Plants	*tons*	*value*
Building	3	8,750	$ 13,000	3	12,510	$ 13,839
Rubble	5	3,800	3,985	3	2,110	2,952
Riprap	11	106,790	87,586	12	92,660	103,777
Concrete & road metal	25	1,199,230	1,306,984	29	1,158,490	1,182,773
Railroad ballast	3	112,040	109,160	5	107,390	45,809
Flux	2	6,840	9,767	2	10,160	17,923
Agriculture	18	207,660	180,770	19	193,050	159,752
Sugar factories, etc.	5	10,417	28,736	4	48,630	28,168
	35	1,666,270	1,742,252	41	1,625,000	1,560,066

Iowa ranked seventeenth among the states in the production of limestone in 1929. Pennsylvania was the leader, followed closely by Ohio, Michigan and New York. In values, however, Indiana was far and away the leader, on account of its output of high grade building stones from the Bedford quarries. Output from some of the important states was as follows:

State	*Tons*	*Value*
Pennsylvania	14,525,080	$ 14,024,287
Ohio	14,241,690	11,789,747
Michigan	13,572,010	8,425,261
New York	11,105,850	13,841,827
Illinois	8,345,080	6,965,264
Indiana	5,129,220	22,191,883
Missouri	4,093,430	5,704,241
Wisconsin	3,441,070	3,882,645
West Virginia	3,301,160	2,978,873
Texas	3,238,760	2,390,235
Total for U. S.	100,686,960	$113,906,071

The total amount of stone of all kinds produced in the United States during this year was 141,109,580 tons with a value of $202,692,-

762. The amount of lime sold from the 400 producing plants was 4,260,000 tons, valued at $33,387,000. Pennsylvania was leader also in total quantity of stone produced, with Ohio second here also, but again Indiana was leader in values, with Pennsylvania second and New York third. Ohio was leader in lime burning and Pennsylvania was second.

The following is a list of limestone producers in Iowa:

Allamakee County
Holtzhammer & Kaiser, La Crosse, Wis. Quarry at Heitman
Thomas Eagon, La Crosse, Wis. Quarry at Lansing
City of Lansing, Lansing
Allamakee County, Highway Dept., Waukon

Appanoose County
Wm. B. Swan, Plano

Black Hawk County
The Builders Material Co., Cedar Rapids. Brandon (Hawkeye Quarry)
A. Bartlett, 1165 E. Fourth St., Waterloo
Waterloo Dredging Co., W. Mullan Ave., Waterloo

Bremer County
Waverly Stone & Gravel Co., Fowler Bldg., Waterloo. Quarry at Waverly

Butler County
Concrete Materials Corp., Waterloo. Quarry at Clarksville
Chicago, Rock Island & Pacific Ry. Co., La Salle Street Station, Chicago, Ill. Quarry at Clarksville

Cerro Gordo County
Henry Kuppinger, Mason City
Stoddard Stone Products Co., J. C. Stoddard, Mason City
N. W. States Portland Cement Co., Mason City
Quimby Stone Co., C. K. Quimby, 24 13th St., N. E., Mason City

Clayton County
H. D. Kregel Estate, Garnavillo
Western Quarry Co., 1422 Walnut St., Des Moines
E. C. Schroeder & Co., McGregor
U. S. Engineer Office, Box J. Commercial Sta., St. Paul Minn. Quarry at McGregor

Clinton County
C. T. Hanrahan, Charlotte
Arthur Daniels, Lost Nation
N. A. Gaarde, Clinton
Lee Bloore, 1619 N. 4th St., Clinton
George T. Smith, 700 S. Bluff Blvd., Clinton

Dallas County
Chicago, Rock Island & Pacific Ry. Co., La Salle Street Station, Chicago, Ill. Quarry at Van Meter

Decatur County
Davis City Quarry Co., Davis City

Des Moines County
Limestone Fertilizer Co., Whitaker Bldg., Davenport. Quarry near Oakland, Louisa Co.

Dubuque County
Wm. Becker, 1333 Kaufman Ave., Dubuque
Ludwig Grassel, Dubuque
Dubuque Stone Products Co., Dubuque
Okey & Fager, Cassville, Wis. Quarry at Dubuque
B. N. Arquitt, Farley
Dubuque County, Highway Dept., Dubuque. Quarry at Waupeton

Fayette County
M. O. Weaver, Iowa Falls. Quarry at Fayette
Weaver Construction Co., Fayette
Graham & Schenk Co., West Union

Floyd County
H. L. Winskeel, Benton, Wis. Quarry at Lithograph City (Orchard)
Henry Gaythre, R. D. 6, Charles City

Hardin County
Iowa Limestone Co., 907 Bankers Trust Bldg., Des Moines. Quarry at Alden

Henry County
J. F. Lynn, 120 S. La Salle St., Chicago, Ill. Quarry at Mount Pleasant

Howard County
Cresco Stone & Concrete Co., Cresco

Jackson County
Isaac Voelpell, Baldwin
Clarence C. Putman, Bellevue
A. A. Hurst, Maquoketa. Quarry at Hurstville (near Maquoketa)

Johnson County
River Products Co., 20-21 Schneider Bldg., Iowa City. Quarry at Coralville (Conklin Quarry)

Jones County
Men's Reformatory, Anamosa

Production of Limestone and Lime in Iowa in 1929

Counties	Plants	Building stone, rubble, riprap		Concrete, road metal		Other uses(a)		Total	
		tons	*value*	*tons*	*value*	*tons*	*value*	*tons*	*value*
Allamakee(1), Fayette(1), Winneshiek(1)	3	.....	.....	46,830	$ 56,560	(b)	.....	46,830	$ 56,560
Black Hawk(2), Butler(1)	3	.....	.....	165,560	146,936	(b)	.....	165,560	146,936
Cerro Gordo (2), Floyd (1) Howard (1), Mitchell (1)	5	.....	.....	57,554	38,625	15,608	$ 20,445	73,162	59,070
Clayton	3	.....	.....	70,800	74,250	.....	.....	70,800	74,250
Clinton (2), Jackson (3)	5	58,550	$ 60,550	5,700	7,448	4,000	9,025	68,250	77,013
Dallas (1), Madison (1), Pocahontas (1)	3	.....	.....	161,466	146,980	4,116	3,104	165,582	150,084
Dubuque	4	(b)	.....	144,847	162,656	(b)	.....	144,847	162,656
Hardin (1), Marshall (2)	3	(b)	.....	201,308	195,907	115,372	81,692	316,680	277,599
Johnson (1), Jones (2)	3	10,215	11,015	130,265	149,849	17,409	16,779	157,889	177,643
Lee (2), Van Buren (3)	5	17,593	24,467	49,234	70,992	40,656	10,715	107,483	106,174
Linn (1), Muscatine (1) Scott (2)	4	(b)	.....	214,287	205,027	93,622	62,681	307,909	267,708
Totals	41	107,280	120,568	1,158,490	1,182,773	359,230	251,652	1,625,000	1,560,066
Totals for 1928	35	119,340	104,571	1,199,230	1,306,984	336,957	328,433	1,667,721	1,761,908

(a) Includes: Railroad ballast, flux, sold to sugar factories, agricultural limestone, railroad fills, lime.
(b) Included in Concrete.

Columbia Quarry, Geo. B. Shaler & G. J. Albright, Cedar Rapids. Quarry at Stone City
H. Dearborn Sons, Stone City
Jno. Ronen, Estate, Anamosa Quarries, Stone City

Lee County
McManus Quarries Co., Inc., 112 Masonic Bldg., Keokuk. Quarry at Ballinger Station
Keokuk Quarry & Constr. Co., Frank L. Griffey, 1325 Main St., Keokuk

Linn County
Builders' Material Co., Cedar Rapids
Falcon & Reinking, Inc., Box 761, Cedar Rapids. Quarries at Adair and Cedar Rapids.
Jos. Verba, Mt. Vernon

Louisa County
County Engineer, Loulsa County, Wapello

Madison County
Hawkeye Portland Cement Co., 802 Hubbell Bldg., Des Moines. Quarry at Earlham

Marshall County
Chicago & North Western Ry. Co, 400 W. Madison St., Chicago, Ill. Quarry at Le Grand
Le Grand Lime Stone Co., Le Grand (Main office, 29 S. La Salle St., Chicago, Ill.)
Marshall County, County Engineer, Marshalltown

Mitchell County
Plim Dykeman, Orchard
F. L. Belzer, Osage
H. L. Wilson, Osage

Pocahontas County
N. W. States Portland Cement Co., Gilmore Portland Cement Corp., Mason City. Quarry at Gilmore

Scott County
Dolese Bros. Co., 205 W. Wacker Drive, Chicago, Ill. Quarry at Buffalo
Linwood Cement Co., 713 Kahl Bldg., Davenport. Quarry at Linwood
Herman Witt, R. D. 1, McCausland. Quarry at Gambril

Van Buren County
Des Moines Valley Stone Co., Bonaparte
Douds Stone Co., H. E. Millen, Secy., Douds
W. H. Swank, Fairfield. Quarry at Farmington

Winneshiek County
Hallett Construction Co., Crosby, Minn. Quarry at Decorah (1½ mi. from—on farm of Ed Yeoman)
Decorah Stone Products Co., Decorah
M. O. Weaver, Webster City. Quarry at Decorah
State of Iowa, Highway Dept., Ames

SAND AND GRAVEL

The two main features in the sand and gravel industry during 1929 were the downward trend in the output and sale of structural materials in both classes and the upward trend in the use of these materials for paving and other road-making purposes. Naturally these trends reflect conditions in these industries—building was slowing down, paving was speeding up. Other changes are noticeable, but are of much less importance. Iowa's sands and gravels are of such nature that they will always find their chief uses in these rougher phases of construction and industry.

Another notable feature of this as of other years is the fluctuations in county productions. Certain counties which show a high production in one year may show little or none in the succeeding year. This again reflects local construction conditions, as these materials are normally transported only short distances. When building or road mak-

ing is active in a locality production of construction materials will flourish. When work slackens output decreases.

Muscatine was the leading county in tonnage with Cerro Gordo, Butler, Sac, Polk and Mahaska following in that order. In values Muscatine led and Cerro Gordo, Sac, Mahaska, Polk and Butler were next in order. The Concrete Materials Corporation of Waterloo, with pits in several counties, was the largest producer, the Ideal Sand and Gravel Co. of Mason City was second, and the Automatic Gravel Products Co. of Muscatine was third.

Summary of Sand and Gravel Production, 1928 and 1929

Materials	1928			1929			Ave. price
	Pits	*tons*	*value*	Pits	*tons*	*value*	
Sand							
Molding	5	64,929	$ 43,667	3	48,558	$ 32,911	$ 0.68
Building	38	531,400	280,843	39	442,491	224,833	.51
Paving and roads	38	1,088,377	450,712	42	1,294,148	538,416	.42
Grinding, polishing	3	14,087	31,789	3	18,676 (b)	41,050	
Engine	10	35,608	17,163	10	44,338	22,146	.50
Filter	1	(a)					
R. R. ballast	3	10,660	3,060	3	26,345	5,726	.22
Other	3	88,737	45,370	7	12,723	2,965	.23
Total sand	60	1,833,798	872,604	62	1,887,279	868,047	
Gravel							
Building	38	341,533	333,079	40	317,719	254,666	.80
Paving and roads	43	1,013,941	790,344	44	1,600,895	973,893	.61
R. R. ballast	12	228,529	83,703	7	224,204	93,587	.42
Other	5	5,818	15,225	4	13,572	21,559	1.60
Total gravel	64	1,589,821	1,222,351	64	2,156,330	1,343,705	
Total output	80	3,423,619	2,094,955	80	4,043,609	2,211,752	.55

(a) Included in Other sand.
(b) Includes filter sand, average price $2.74; blast sand, average price $2.03.

Production of sand and gravel throughout the nation was the highest in its history, the gain over 1928 amounting to 6.4 per cent. The same trends—downward in the case of structural material and upward in case of road making and ballast—were evident in national produc-

tion as in our own state. The largest producers were as shown in the following list:

State	*Tons*	*Value*
New York	21,061,094	$ 14,919,658
Illinois	18,256,203	9,071,258
Michigan	16,844,099	7,928,744
California	15,688,545	8,371,263
Ohio	14,250,141	9,182,862
Pennsylvania	12,674,320	13,658,328
Indiana	10,901,798	5,528,832
Wisconsin	10,727,632	4,574,182
Texas	9,409,295	5,765,943
New Jersey	6,721,498	5,585,285
Total for U. S.	222,571,905	$132,835,979

Iowa ranked fifteenth in production and sixteenth in value.

Production of Sand and Gravel in 1929—Sand

Counties	Pits	Structural sand		Paving sand		Other sand (a)		Total sand	
		tons	*value*	*tons*	*value*	*tons*	*value*	*tons*	*value*
Allamakee (0), Clayton (1), Fayette (1), Winneshiek (2)	4	.....	.....	69,655	$ 56,072	(c)	.....	69,655	$ 56,072
Black Hawk(3), Floyd(1), Tama(1)	5	54,455	$ 32,959	49,460	28,906	(c)	.....	128,471	76,073
Boone(1), Marshall(2), Story(0)	3	22,939	12,095	22,668	11,298	(c)	.....	45,607	26,993
Butler	3	15,222	5,262	76,189	19,388	(c)	.....	91,411	24,650
Cerro Gordo(2), Franklin(0), Hancock (1)	3	72,500	31,750	155,068	54,653	12,500	$ 5,250	240,068	90,056
Clinton	3	41,927	17,377	28,386	6,673	.....	.....	70,313	24,050
Crawford (0), Harrison (1), Plymouth (1)	2	(b)	.....	(d)	.....	.....	.....	(g)	.....
Dallas(0), Mahaska(1), Marion(2)	3	(c)	.....	180,950	89,852	.....	.....	180,950	89,852
Des Moines (2), Lee (2)	4	12,737	5,740	20,223	8,040	(c)	.....	32,960	13,780
Dubuque (2), Jackson (1)	3	(c)	.....	101,547	29,071	.....	.....	101,547	29,071
Emmet(1),Osceola(1), Palo Alto(2)	4	8,303	6,393	.....	.....	(f)	.....	8,303	6,193
Humboldt (1), Pocahontas (1), Webster (1), Wright (1)	4	6,460	3,290	79,705	21,413	(c)	.....	86,365	24,703
Johnson(1), Linn(2), Scott(1)	4	24,315	19,115	129,877	80,764	9,192	4,019	160,384	100,398
Lyon (1), Sioux (3)	4	(c)	.....	167,716(e)	92,619	(c)	.....	167,716	92,619
Muscatine	4	82,636	41,494	118,079	30,034	34,230	49,541	234,945	121,069
Polk	5	56,583	27,250	129,520	64,953	(c)	.....	186,103	92,203
Sac	4	(c)	.....	124,954	47,407	.....	.....	124,954	47,407
Total	62	442,491	224,833	1,294,148	538,416	150,640	104,798	1,887,279	868,047
Totals for 1928	60	531,400	280,843	1,088,377	450,712	214,021	141,049	1,833,798	872,604

(a) Includes: Molding, grinding, polishing, blast, engine, filter, ballast, other sands.
(b) Included with structural gravel.
(c) Included with paving sand.
(d) Included with paving gravel.
(e) Includes paving gravel.
(f) Included with structural sand.
(g) Included with total sand and gravel.

Production of Sand and Gravel in 1929—Gravel

Counties	Pits	Structural gravel		Paving and other gravel (h)		Total sand and gravel		Total quantity washed	
		tons	*value*	*tons*	*value*	*tons*	*value*	*tons*	*value*
Allamakee (1), Clayton (0), Fayette (1), Winneshiek (2)	4	12,718	$ 8,210	74,968	$ 40,031	157,331	$ 104,321	127,976	$ 83,062
Black Hawk(2), Floyd(0), Tama(1)	3	10,136	13,716	28,585	27,768	142,636	103,349	127,043	94,109
Boone (2), Marshall (2), Story (2)	6	14,833	12,401	144,580	21,800	211,322	63,646	66,062	41,496
Buena Vista (2), Dickinson (1)	3	(d)	.....	139,739	29,763	139,739	29,763	.....	.....
Butler	3	(d)	.....	283,005	116,774	374,416	141,424	221,412	125,902
Cerro Gordo(2), Franklin(1), Hancock (1)	4	20,100	23,550	177,568	163,653	435,736	278,856	382,500	271,500
Clinton	5	72,613	37,638	75,936	40,100	218,862	101,788	196,208	82,863
Crawford (2), Harrison (1), Plymouth (1)	4	8,386(i)	5,436	60,386(j)	21,986	68,772	27,422	.....	.....
Dallas(1), Mahaska(1), Marion(1)	3	(d)		220,186	170,055	401,136	259,907	366,636	242,657
Des Moines (2), Lee (1)	3	15,548	12,903	(b)	.....	48,508	26,683	34,158	18,161
Dubuque (2), Jackson (1)	3	31,139	15,830	118,920	85,209	251,606	130,110	193,086	119,930
Emmet(1), Osceola(1), Palo Alto(2)	4	1,617	240	36,213	6,764	45,133	13,197	.....	.....
Humboldt (1), Pocahontas (1), Webster (1), Wright (1)	4	11,017	10,792	76,272	44,100	173,689	79,595	94,404	70,537
Johnson(1), Linn(0), Scott(1)	2	.....	.....	(c)	.....	163,384	103,898	162,384	102,898
Lyon (0), Sioux (1)	1	.....	.....	(c)	.....	167,716	92,619	131,000	82,400
Muscatine	4	19,399	13,310	149,656	121,755	435,220	282,175	435,220	282,175
Polk	4	31,845	39,881	35,064	40,693	253,012	172,877	253,012	172,877
Sac	5	22,120	15,105	204,472	137,318	352,381	200,122	280,027	190,217
Totals	64	317,719	254,666	1,838,611	1,089,039	4,043,609	2,211,752	3,089,611	1,992,835
Totals for 1928	64	341,533	333,079	1,248,288	889,272	3,423,619	2,094,955	2,847,553	1,873,539

(b) Included with structural gravel.
(c) Included with paving sand.
(d) Included with paving gravel.
(h) Includes: Paving and roadmaking, railroad ballast, other gravels.
(i) Includes structural sand.
(j) Includes paving sand.

The following is a list of sand and gravel producers in Iowa:

Allamakee County
- Northeastern Iowa Sand & Gravel Co., Harpers Ferry

Black Hawk County
- Concrete Materials Corp., 504 Lafayette Bldg., Waterloo
- Iowa Foundry Sand Co., 106 Western Ave., Waterloo
- Waterloo Dredging Co., 85 W. Mullen, Waterloo
- Waterloo Sand & Gravel Co., C. H. Werner, P. O. Box 553, Waterloo

Boone County
- McHose Sand & Tile Co., Boone. Pit at Fraser
- Markey River Sand Co., R. B. Markey, Boone

Buena Vista County
- Buena Vista Highway Dept., care of County Engineer, Storm Lake
- L. L. Walton, Linn Grove
- Chicago & North Western Ry. Co., 226 W. Jackson St., Chicago, Ill. Pit at Sioux Rapids

Butler County
- Concrete Materials Corp., 504 Lafayette Bldg., Waterloo. Pit at Clarksville
- Aplington Cement Tile & Block Works, Chas. Willeke, Aplington
- Waverly Gravel & Tile Co., Waverly. Pit at Shell Rock

Calhoun County
- Calhoun County Highway Dept., Rockwell City

Carroll County
- Chicago Great Western R.R. Co., 122 S. Mich. Blvd., Chicago, Ill. Pit at Lanesboro

Cerro Gordo County
- Clear Lake Sand & Gravel Co., Clear Lake
- Ideal Sand & Gravel Co., Mason City
- Chicago, Mil., St. P. & P. R. R. Co., New Union Sta., Chicago, Ill. Pit at Plymouth

Cherokee County
- Harris & Loucks Gravel Co., Cherokee
- Illinois Central Ry. Co., Chicago, Ill. Pit at Cherokee
- Iowa Gravel Products Co., M. R. Gibbons, 3330 Maynard St., Cleveland, Ohio. Pit at Cherokee
- Northwestern Gravel Co., Lake View. Pit at Cherokee

Clay County
- John F. Stolley, Spencer
- Spencer Cement Block Works, Lock Box 344, Spencer

Clayton County
- Clayton White Sand Co., Clayton
- Langworthy Silica Co., 902 Federal Bank Bldg., Dubuque. Pit at Clayton
- State Highway Dept., Ames. Pit at Osborne

Clinton County
- Clinton County, care of County Engineer, Clinton
- Clinton Sand & Gravel Co., E. A. Schultz, Pres., 604 Wilson Bldg., Clinton
- Camanche Sand & Gravel Co., United Light Bldg., Davenport
- Schneider Sand & Gravel Co., Clinton
- Jenner Bros., 320 First Natl. Bank, Davenport. Pit at De Witt
- A. F. Barber, R. D. 2, Grand Mound

Crawford County
- Crawford County, care of County Engineer, Denison
- Hannah Carlson, Kiron

Dallas County
- Commercial Sand Co., & Portland Sand & Gravel Co., 513 Youngerman Bldg., Des Moines. Pit at Booneville
- Coon River Sand Co., 218 9th St., Des Moines. Pit at Van Meter

Des Moines County
- Kelley Sand & Fuel Co., R. J. Dietlein, Burlington. Pit near Oquawka, Ill.
- Burlington Sand & Gravel Co., Burlington

Dickinson County
- Chicago, Mil., St. P. & P. R. R. Co., New Union Sta., Chicago, Ill. Pit at Milford

Dubuque County
- Iowa Gravel & Fuel Co., Inc., 501 Garfield Ave., Dubuque
- Chicago, Mil., St. P. & P. R. R. Co., New Union Sta., Chicago, Ill. Pit at Dubuque
- Molo Sand & Gravel Co., Foot of 3d St., Dubuque

Emmet County
- Wm. Stuart, Armstrong
- Atwood, Korrect & Stewart, Armstrong. Pit at Estherville
- Cement Products Co., Estherville
- Chicago, R. I. & Pac. Ry. Co., La Salle St. Sta., Chicago, Ill.

Fayette County
- Clermont Brick & Sand Co., Clermont

Floyd County
- Iowa Foundry Sand Co., Waterloo. Pit at Floyd

Chicago, R. I. & Pac. Ry. Co., La Salle St. Sta., Chicago, Ill. Pit at Marble Rock

Franklin County
W. C. Nolte, Sheffield

Hancock County
Hancock County Highway Dept., Garner

Hardin County
Chicago & N. W. Ry. Co., 226 W. Jackson St., Chicago, Ill. Pit at Gifford
Minneapolis & St. Louis R. R., Minneapolis, Minn. Pit at Gifford

Harrison County
Rogers Brothers, Dunlap
M. B. Musgrave, Woodbine
McDougal Constr. Co., Sioux City

Humboldt County
Humboldt Gravel & Tile Co., Humboldt

Jackson County
Bellevue Sand & Gravel Co., L. E. Duvall, Mgr., Bellevue
Chicago, Mil., St. P. & P. R. R. Co., New Union Sta., Chicago, Ill. Pit at Smiths

Johnson County
Hawkeye Material Co., P. O. Box 104, Iowa City
Schmidt Sand & Gravel Co., R. F. D. 4, Iowa City
W. Stock, River Junction

Jones County
Chicago, Mil., St. P. & P. R. R. Co., New Union Sta., Chicago, Ill. Pit at Monticello

Lee County
Jos. Jaeger, Montrose. Pit at Fort Madison
Keokuk Sand Co., Ft. of Bank St., Keokuk

Linn County
Kings Crown Plaster Co., 98 First Ave. W., Cedar Rapids
Larimer & Shaffer, 931 North 1st St., W., Cedar Rapids
Ed. Sigfred, Marion. Pit at Springville

Louisa County
State Highway Dept., Ames. Pit at Oakville

Lyon County
Great Northern Ry. Co., St. Paul, Minn. Pit at Doon
Miller Sand & Gravel Co., Box 101, Doon
Chicago, Rock Island & Pacific Ry. Co., La Salle St. Sta., Chicago, Ill. Pit at Granite

Mahaska County
Concrete Materials Corp., W. W. Reilly, Eddyville

Marion County
Harvey Sand & Gravel Co., Harvey
Wilson Sand & Gravel Co., Harvey. Pit at Tracy

Marshall County
Empire Sand & Material Co., A. L. Keller, Lock Box 467, Marshalltown. Pit at Keller
R. M. Hawkins, 1110 N. 3d Ave., Marshalltown

Mitchell County
J. C. B. McIntire, McIntire
Burton Stacy, Osage

Muscatine County
Chicago, Rock Island & Pacific Ry. Co., La Salle St. Sta., Chicago, Ill. Pit at Fruitland
Automatic Gravel Products Co., Box 34, Muscatine
Hahn Brothers Sand & Gravel Co., 207 W. Front St., Muscatine
C. A. Hagermann, Muscatine
Northern Gravel Co., Muscatine
Pearl City Gravel Co., Ed. L. Hahn, Muscatine

Osceola County
Chicago, Rock Island & Pacific Ry. Co., La Salle St. Sta., Chicago, Ill. Pit at Sibley

Palo Alto County
County Highway Dept., Emmetsburg
Chicago, Rock Island & Pacific Ry. Co., Chicago, Ill. Pit at Graettinger
Graettinger Tile Works, Graettinger
State Highway Dept., Ames. Pit at Osgood

Plymouth County
Big Sioux Gravel Co., Akron
Albert A. Wenzel, Kingsley. Pit at Pierson

Pocahontas County
Pocahontas County Highway Dept., care of County Engineer, Pocahontas

Polk County
Chicago, Rock Island & Pacific Ry. Co., La Salle St. Sta., Chicago, Ill. Pits at Avon and Commerce
Des Moines & Central Iowa R. R. Co., Des Moines
Commerce Sand & Gravel Co., G. N. Doty, Pres., Box 4, Commerce
Capital City Sand Co., 1111 29th St., Des Moines
Coon River Sand Co., 501 Hubbell Bldg., Des Moines
The Des Moines Sand & Fuel Co., 510 Grand Ave., Des Moines

Hawkeye Co-operative Sand & Gravel Co., John Keefner, Pres., 822 W. 9th St., Des Moines
N. Leon Harris, R. R. 4, Lock Box 507, Des Moines
Independent Sand & Gravel Co., 325 S. W. 7th St., Des Moines
Flint Crushed Gravel Co., Des Moines. Pit at Granger
Portland Sand & Gravel Co., & Commercial Sand Co., 513 Youngerman Bldg., Des Moines
O'Rourke Constr. Co., Des Moines

Sac County
LeGrand Crushed Rock & Gravel Co., Lake View
Chicago & N. W. Ry. Co., 226 W. Jackson St., Chicago, Ill. Pit at Lake View
Wm. Brauer, R. F. D. 1, Lake View
Northwestern Gravel Co., Lake View
LeGrand Limestone Co., 29 S. La Salle St., Chicago, Ill. Pit at Sacton (Lake View)
Mrs. Nils Miller, Sac City
Sac County, Office of Engr., Sac City
W. H. Schnirring, Sac City
Mrs. W. H. Townsend, Sac City

Scott County
Scott County, Office Engr., Davenport
Builders Sand & Gravel Co., 626 W. Front St., Davenport. Pit at Buffalo
Chicago, Rock Island & Pacific Ry., La Salle Sta., Chicago, Ill. Pit at Buffalo
W. G. Block Co., 319 E. Fourth St., Davenport

Sioux County
D. A. Sorgdrager, R. D. 1, Alton
Alton Cement Works, C. Vandermeer, Alton
L. G. Everist, Inc., 2100 E. 4th St., Sioux City. Pit at Hawarden
Hawarden Gravel Co., Hawarden
Schemmer Sand & Gravel Co., Rock Valley
Rock Valley Sand & Gravel Co., Rock Valley

Story County
Ames Sand & Gravel Co., Ames
R. E. Carr Sand & Gravel Co., E. 16th St., Ames
Story County, Office of County Engineer, Nevada. Pit at Ames
H. R. Maudlin, 414 J Ave., Nevada
Roy Templeton, Ames

Tama County
Standard Gravel Co., 907 Bankers Tr. Bldg., Des Moines. Pit at Tama

Wapello County
Ottumwa Sand Co., Ottumwa

Webster County
Johnston Clay Works, Inc., Ft. Dodge. Pit at Clayworks

Winneshiek County
E. W. Hallett & Co., Decorah
Ward & Taylor Constr. Co., Decorah

Wright County
Belmond Cement Mfg. Co., Belmond
Luick Gravel Co., Belmond
Chicago, R. I. & Pacific Ry. Co., 902 La Salle St. Sta., Chicago, Ill. Pits at Belmond
Chicago Great Western R. R. Co., Chicago, Ill. Pit at Belmond

THE CLARINDA OIL PROSPECT

On November 5, 1928, Iowa's First Oil Developing Co., of Clarinda, Iowa, began an oil prospect on the Wilson farm, in the bottoms of Nodaway river, about four miles south of Clarinda, in the SE. ¼, SE. ¼, Sec. 24, T. 68 N., R. 37 W., Page county. Elevation of curb 988 feet. The drillers were G. H. Rose and Son of Maryville, Mo. Work was abandoned December 8, 1930. Although neither oil nor gas was found in quantity the drilling has aroused much interest, and a summary of the strata penetrated is given here. A more complete report will be published later.

Strata	*Depth*		*Thickness*
Pleistocene and Recent—clay	0	–25	25
Pennsylvanian			
Missouri			
Shawnee—limestone and shale	25	–140	115
Douglas—limestone and shale	140	–375	235
Lansing—limestone and shale	375	–540	165
Kansas City—limestone and shale	540	–660	120
Des Moines			
Pleasanton and Henrietta—limestone and shale	660	–920	260
Cherokee—sandstone and shale	920	–1,610	690
Mississippian			
Meramec—limestone	1,610	–1,765	155
Osage—limestone and shale	1,765	–1,858	93
Chouteau—limestone	1,858	–1,895	37
Kinderhook—limestone and shale	1,895	–2,016	121
Devonian—limestone	2,016	–2,101	85
Silurian—limestone and dolomite	2,101	–2,555	454
Ordovician			
Maquoketa—shale, some dolomite	2,555	–2,595	40
Galena—dolomite, some shale	2,595	–2,945	350
Decorah—shale and dolomite	2,945	–2,992	47
St. Peter—sandstone and dolomite	2,992	–3,067	75
Shakopee—dolomite	3,067	–3,124	57
New Richmond—sandstone	3,124	–3,162	38
Oneota—dolomite	3,162	–3,313	151
Cambrian			
Jordan—sandstone	3,313	–3,340	27
Bonneterre, Eau Claire—dolomite	3,340	–3,554	214
LaMotte, Mount Simon—sandstone	3,554	–3,570	16
Red Clastics or Sioux Quartzite—sandstone or quartzite	3,570	–4,671	1,101